HORSELESS AGE The oldest automotive paper published in the English language has been purchased by the Class Journal Co. Its maintenance features, and a part of its circulation, have been merged with MOTOR AGE

MOTOR AGE

Vol. XXXIV
No. 9

PUBLISHED WEEKLY
CHICAGO, AUGUST 29, 1918

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Hudson dealers will have a foundation more solid than granite upon which to build their post-war business.

HUDSON SUPER SIX

Hudson Motor Car Co., Detroit, Michigan

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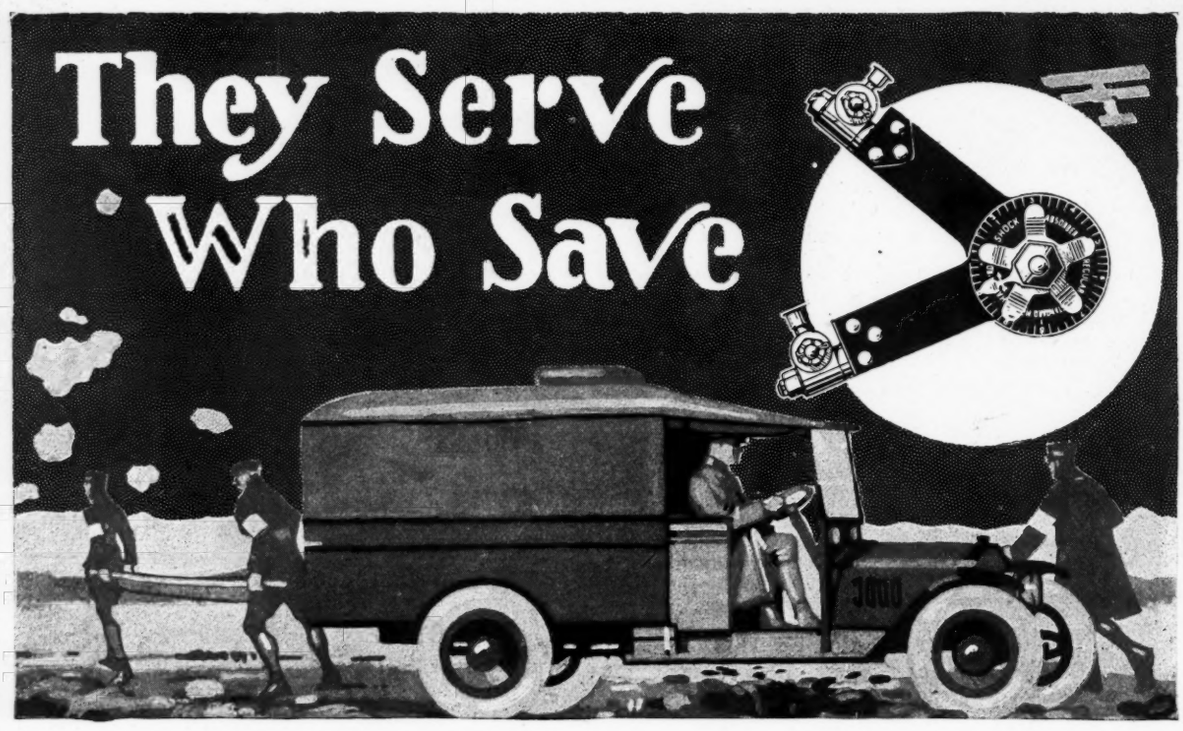

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MOTOR AGE

Published Every Thursday by
THE CLASS JOURNAL COMPANY
MALLERS BUILDING
59 E. Madison St., CHICAGO

HORACE M. SWETLAND, *Pres.* W. I. RALPH, *Vice-Pres.*
E. M. COREY, *Treas.* A. B. SWETLAND, *Gen. Mgr.*

MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

Vol. XXXIV Chicago, August 29, 1918 No. 9

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MOTOR AGE
MALLERS BUILDING Phone Randolph 6960
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SUBSCRIPTION RATES
United States, Mexico and U. S. Possessions...$3.00 per year
Canada ..... 5.00 per year
All other Countries in Postal Union..... 6.00 per year
Single Copies ..... 10 cents

Entered as second-class matter, September 19, 1899, at the Post Office, Chicago, Illinois, under Act of March 3, 1879.
Owned by UNITED PUBLISHERS CORPORATION, 243 W. 39th St., New York. H. M. Swetland, Pres.; Charles S. Phillips, Vice-Pres.; W. H. Taylor, Treas.; A. C. Pearson, Secretary.

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CLEVELAND

Vol. XXXIV, No. 9 Chicago, August 29, 1918 $3.00 Per Year

MOTOR AGE

Tractor Speed in Plowing

What Should It Be?

Too Fast a Pace Reverse of Practicable and Economical in Successful Farming —Over 3 m.p.h. Considered a Mistake

By Fred M. Loomis

Motor Age Editorial Staff

SOMETHING over a year ago a man who for many years has been closely identified with the production and distribution of tractor plows sounded a warning against too great a speed in preparing the land for crop growing. What he said at that time requires emphasizing at this time, for the reason that there are tractor manufacturers who are trying to convince dealers and farmers that high plowing speed is an advantage and that farm work can be expedited by operating tractors at a speed far in excess of the plowing speed which has been accepted for years as the best.

Right Kind of Plowing

Successful agriculture depends primarily upon the right kind of plowing. In presenting this point the plow man mentioned said:

A man who has made a special study of the subject of plowing asserts that the American farmer to-day is not as good a plowboy as he was in the days when walking plows were the only available implements. He asserts as the reason for this that it was necessary for a walking plow to be adjusted or it would tire a man so much in a few rounds of travel that he would not have the strength to operate it continuously. Naturally, when the plow was properly adjusted it was turning the furrow in the proper manner.

It is quite true that a man can operate a wheel plow and do a certain kind of plowing whether it is drawn by horses or by tractor.

There is a grave danger this spring that unless attention is emphatically called to the vital necessity of doing plowing right we are apt to fail on account of too rapid work in order to get all the land under cultivation. The urgent necessity for increased crops may make such a mistake as this common this year.

Whether we use walking, riding or tractor plows, it is vitally necessary that the ground be plowed properly because the right kind of plowing is necessary for crop growing. Poor plowing will do more to decrease a crop increase than any other operation which we have to perform.

In these days of riding plows it is so easy to fail to plow properly that we are getting careless with our plowing. We must remember that the ground to be properly plowed must be thoroughly pulverized from the top to the bottom of the furrow. We can set it down as a fundamental fact that good plowing depends upon the condition of the soil at the time of plowing and the shape of the moldboard. The shape of the moldboard determines the amount of pulverizing the soil will receive, and upon the amount of pulverizing depends the relative draft of pulling the plow. This statement is based upon the supposition that the plows are equipped with the same style landside and shares and are properly adjusted, the only difference being in the shape of the moldboard.

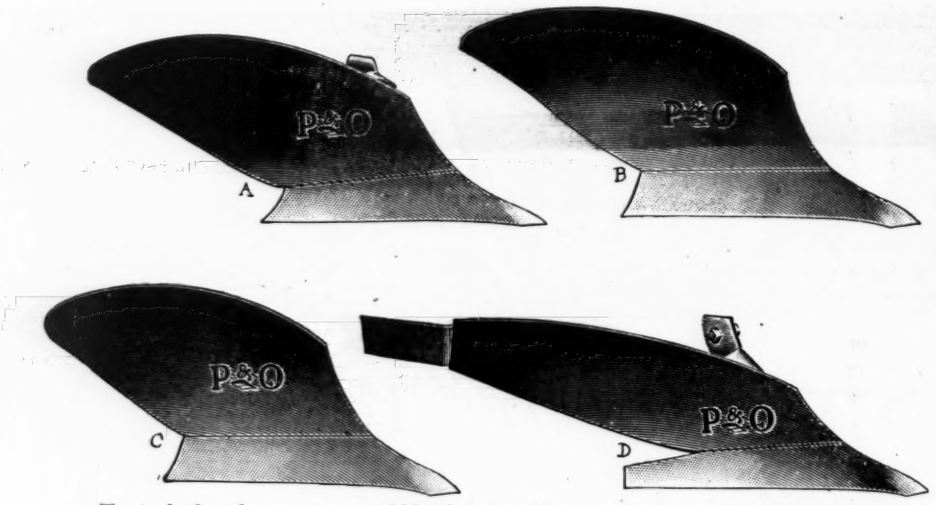
It must be thoroughly understood that an enormous expenditure of effort is necessary to do good plowing. Every farmer naturally desires to keep the draft of his plow as low as possible. This should be done by keeping the plow properly adjusted and in working condition, but under no circumstances should a farmer sacrifice quality of work for light draft.

Supplementary to this it may be said that recent tests determined the fact that the plows which did the best work were plows which registered the heaviest draft, or, to put it in another way, the best plowing was done at the expenditure of the greatest effort.

These facts have a direct and important bearing upon the determination of what shall be considered by the farmer as the best speed for plowing. The idea of speeding up plowing looks attractive and plausible on the face of it. It appears to be obvious that if a tractor moving 2 m.p.h. with three 14-bottoms will plow 8.46 acres in a 10-hr. day, as it will, it will plow 16.92 acres in the same length of time if the speed of the tractor be doubled. It also would appear that the farmer's plowing efficiency would be doubled at the same time. A good many dealers, and, as well, a good many farmers, cannot see why the matter will not work out in this way. They are being encouraged, too, to think so by the statements of certain manufacturers of tractors who have machines with a high speed and who want to use that quality as a sales argument.

Road Speed Given

It is altogether probable that in a good many instances high speed was given to a tractor originally upon the supposition that it would be used for road work, where a speed higher than that common in farming operations might be considered an advantage. This supposition, however, was not borne out by the facts. In the first place, the farmer did not take kindly to the notion of using his tractor as a road hauling machine and at the present time there are few tractor manufacturers who still stick to the idea that the ordinary farm tractor ever will be used for that purpose, except occasionally. In the second place, it was found that the usual methods of tractor construction were such that they would not stand up for long under the strains and vibrations of high-



Typical plow bottoms; a, stubble; b, general purpose; c, another form for general purpose; d, sod bottom

speed road work. Under road conditions even the sturdiest construction would go to pieces very speedily. Thus high speed, originally designed for road use, was left on the hands of some of the manufacturers as a quality in their tractors which they did not know what to do with. They turned to plowing as a solution and began to advocate high-speed plowing. The pity of it is, too, that some dealers and farmers were influenced by the representations that were made to them, to their subsequent regret.

Builders for Years

There are manufacturers of tractors who have been building and marketing machines successfully for many years. Some of these as well are builders of plows or are closely affiliated with concerns which do build plows. These tractor manufacturers have had vast and varied experiences. They have designed tractors to meet all sorts of conditions and to work in all sorts of circumstances. A majority of the tractors these concerns have put out have been used primarily for plowing and the manufacturers knew that they would be so used. It would appear, then, that if high speed in plowing could be an advantage, surely some of these experienced manufacturers would have discovered the fact and would have invested their machines with a speed to correspond. But, what are the facts?

No tractor company has had a more extensive experience than the Avery Co. Yet this company gives to its tractors a speed range of from 2 to 3¾ m.p.h. only. The International Harvester Co., with tractors at work in every civilized quarter of the globe, contents itself with a still narrower range, namely, from 1.8 to 2½ m.p.h. The J. I. Case Threshing Machine Co., another concern with a world-wide experience, limits its speed range between 1¾ and 3½ m.p.h. The Emerson-Brantingham Co., the Moline Plow Co., the Wallis Tractor Co., and the La Crosse Tractor Co., all builders of both tractors and plows, or closely identified with affiliated plow-building companies, have tractor speed ranges respectively as follows: E-B, 1¾ to 2½ m.p.h.; Moline, 1 to 3 m.p.h.; Wallis, 2½ to 3½ m.p.h.; La Crosse, 2½ m.p.h.

Compare these speed ranges, based upon world-wide experience, with the 2¼ to 5, 2 to 5, 2 to 5½, 1 to 10, 2⅝ to 6, 2½ to 5½ m.p.h., claimed for some tractors now on the market, made by concerns which admittedly have not had as much experience as the older companies and which for the most part have no connection at all with concerns building plows. Yet the idea that rapid plowing is practicable, economical and advantageous is receiving encouragement from some of these companies. As a matter of fact, too great speed in plowing is quite the reverse of practicable, economical and advantageous, and this for many reasons.

Probably these reasons have been summed up as clearly and as comprehensibly by the International Harvester Co. as by anyone, therefore it will be pertinent to quote here what that company says:

The speed of tractors is necessarily limited by the ability of moldboards of plows to turn suitable furrows. Machines designed to operate with horses, such as mowers, binders, reapers, grain drills, etc., will not work satisfactorily at much higher speeds than those at which horses walk. Higher speeds in tractors, therefore, would necessitate redesigning nearly all farm machinery for use with tractors only. There are a number of objections to this from a manufacturing standpoint, a few of which are: A division of production between horse-operated and tractor-operated machinery; increased cost of production because of reduced volume of any one type of machine; radical changes in construction to compensate for greater strains from operating at higher speed; increased stock necessarily carried by dealers because of divided demand between horse-operated and tractor-operated machines.

Tendency Toward Speeds

Although the tendency seems to be toward higher speeds in farm work, it is due, no doubt, to the change from horse-power to mechanical power without realizing the limitations of mechanical power. Some seem to have the idea that as long as it is a tractor it can be made to travel at an increased rate of speed and thus do more work. This, of course, brings up the point of drawbar pull. A tractor that travels 2½ m.p.h., if it has a drawbar pull of 1,500 lb., will deliver 10 hp. at the drawbar. This tractor under ordinary conditions will pull three plows. If we take the same tractor and give it a speed of 3 m.p.h., its drawbar pull will be cut down to 1,300 lb. and it no longer can be considered a three-plow tractor. In this case it would probably not be safe to use over two plows. This same tractor pulling two plows at 3 m.p.h. will do only four-fifths as much work as it will when pulling three plows a 2½ m.p.h.

Two Main Considerations

It will thus be seen that there are two main things to be taken into consideration in determining the speed of a tractor, first, that the greater the speed for a given size the smaller the drawbar pull. Now, in order to pull the same number of plows at an increased speed it would be necessary to increase the horsepower of the engine.

There are also limits to the speed from the standpoint of durability. Considering the weight and size of the tractor, to increase the weight and size means an increase in the original cost and in reality results in turning it to a larger tractor and getting away from the economical small size tractor.

The Emerson-Brantingham Co., in this same connection, says:

As tractors are mainly purchased with a view to their use in connection with plows, the speed of the tractor should be that which will best suit the plow with which it will be used. Plows were designed with a slope of moldboard suited to the average travel of horses. A materially slower speed will result in the improper and inadequate turning of the soil, and a materially faster speed than the average horse travel will result in throwing the soil too far and in ragged, uneven and unsatisfactory plowing. Plows might be designed to suit almost any speed of trvael, but as a result of many years' manufacture they have been standardized as to shape and as to the speed producing most efficient results. Therefore, it would hardly be feasible to entirely revolutionize the plow-manufacturing industry to meet the presumed desire of some person for a plow that could be drawn at a greater speed, with the result that it would multiply types, because the manufacturer still would be compelled to furnish that type adapted to animal power.

Here are presented the views of perhaps the most experienced tractor manufacturing company in existence, and of a concern which has had quite as many years in the designing and building of plows, and which now also builds tractors. These would appear to be conclusive.

What Both Should Know

At the same time there are certain things about plow shapes and drawbar pulls and the ability of a tractor to do work under varying conditions which every dealer who sells tractors and every farmer who buys a tractor should be acquainted with. It is the purpose here briefly to run over some of these matters, illustrating them in such a way that they may be readily comprehended.

First, as to the standardized types of plows. Four typical shapes, all manufactured by the Parlin & Orendorff Co., are shown in the illustration. These are typical merely and differ only in minor details from similar plows manufactured by every other plow company in the country. Every manufacturer also identifies his plows by names and titles which are distinctive, but as there is no material difference in the shapes of the bottoms turned out by the various companies, here these types will be distinguished by names which can be applied commonly to all.

Shape A is typical of what is generally known as the stubble bottom. Another name is the old ground bottom. Both these designations indicate the kind of work this bottom is designed to do, namely, turn soil that already has been cultivated and which is not at the time of plowing covered with sod, either virgin or induced. This shape of bottom has the most abrupt turn to the moldboard of any of the plow types, has therefore the greatest pulverizing effect and also has the greatest draft per square inch of furrow slice of any of the various plow shapes. While sometimes the stubble bottom is used in tame sod, such use is not to be recommended and is not at all general.

General Purpose Bottoms

Shapes B and C are two closely allied shapes of what is known as the general purpose bottom. The shape of the moldboard is not so abrupt as in the stubble bottom, but it is of about the same length. This reduces the pulverizing effect of the bottom and also reduces the draft. The general purpose bottom is most generally used of any of the plow shapes and is adapted to a wide diversity of uses. It can be used in place of the stubble bottom and also is used extensively for turning over tame sod.

Shape D is known as the sod bottom and is distinguished by its very long moldboard. With it there is very little if any pulverizing effect, the bottom being designed rather to turn a continuous furrow slice and it is used for virgin sod, or in very old and tough sods like blue grass or alfalfa. Very little use is found for this bottom on old farms, as there is on such farms but little old sod to turn. The sod bottom is the lightest draft of any of the shapes.

While there are hundreds of distinct shapes to plow bottoms, all fall within the three classifications mentioned. Furthermore, all have been designed to conform to the speed of horses, which rarely exceeds 2¼ m.p.h., and all are designed to do the best work at or near this speed. Manufacturing tendencies, too, irrespective of the pressure brought to bear by the Government for restriction of unnecessary types, is to reduce rather than to increase plow shapes. Thus it is not likely that shapes will be designed for faster speeds and that all attempts to use existing types for speeds other than those for which they have been designed will result in poorer plowing and a defeat of the very ends it is hoped to attain by using the tractor instead of the horse in farming operations. Trying to plow at excessive speed with plows adapted to a standard near 2¼ m.p.h. cannot but result in a danger of failure because of too rapid work in getting land under cultivation.

When tractors first began to make their appearance there were no specially designed tractor plows. Tractor manufacturers were compelled to take plows as they found them and in the beginning wheel plows which had been designed for use with horses were of necessity used. For this reason the normal plowing at which horse-drawn plows always had been operated was accepted and tractors for the most part were designed to plow at from 2 to 2½ m.p.h. As it was considered desirable to rate tractor drawbar pull in units of horsepower it became the custom of tractor manufacturers to rate their tractors on the basis of an uniform speed of 2½ m.p.h., and what the tractor developed in the way of drawbar pull at this speed and on level ground was taken to indicate the amount of horsepower developed by the tractor. The matter was figured out in this way: 5,280 ft., the number of feet in a mile, multiplied by 2½, the speed of the tractor, divided by 60, the number of minutes in an hour, gave the speed per minute of the tractor. This figured out 220 ft. Dividing 33,000 by 220 gave 150, or the number of pounds pull which would be the equivalent of one mechanical horsepower at the given speed. Thus, if the tractor showed a drawbar pull of 1,500 lb. at 2½ m.p.h., it was considered to be a 10-hp. tractor.

This was adopted as the standard of tractor rating, and to-day it is the custom of all tractor manufacturers, where they rate in horsepower units, to rate on this basis. Thus, when a tractor rated as 10-20 is said to be, under ordinary conditions, a three-plow tractor, it means that if the draft of the plow, at 2½ m.p.h., does not exceed 1,500 lb., it can be handled by a 10-20 tractor.

Speed and Soil

But speed and soil conditions affect plow draft and tractor drawbar pull tremendously. It is a mechanical law that any gain in speed is won at an increased expenditure of power. It follows, then, that if the speed of a 10-20 tractor, so rated at a normal speed basis of 2½ m.p.h., be increased to 3 or 3½ m.p.h., the drawbar pull of the machine is diminished, and, plow draft remaining the same, a tractor which at normal speed might be a three-bottom plow, is reduced in efficiency to a two- or even a one-bottom plow by an increase in the speed. Just how rapidly the drawbar pull of a tractor changes under changes in speed is shown by the curve in Diagram I. The curve in this diagram is based upon a drawbar pull of 150 lb. at a speed of 2½ m.p.h. If the speed of the tractor is reduced to 2 m.p.h., the drawbar pull per horsepower increases to 187 lb. and to 250 lbs at 1½ m.p.h. and to as great as 375 lb. if the speed is reduced to 1 m.p.h.

Upon the contrary, if the speed of the tractor be increased from a normal of 2½ m.p.h. to 3 m.p.h., the drawbar pull is cut to 125 lb. per horsepower; to 107 lb. at 3½ m.p.h. and to 75 lb. if the speed be increased to 5 m.p.h.

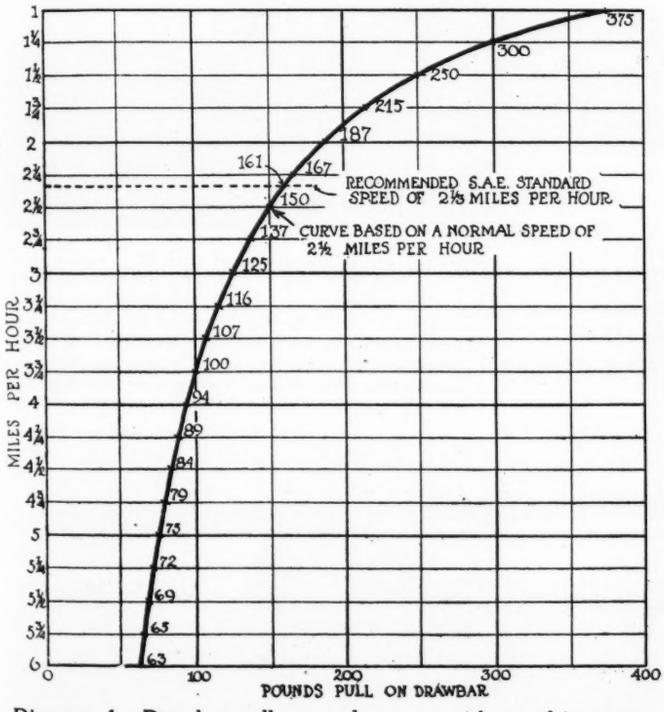


Diagram 1—Drawbar pull curve decreases with speed increase

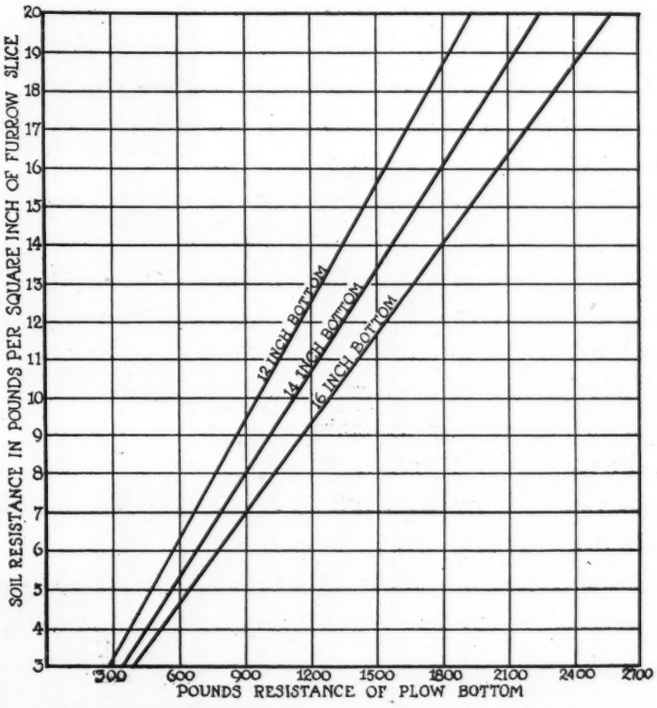


Diagram 2—How character of soil increases resistance

A consideration of this curve and these figures will illustrate the statement of the International Harvester Co. that in order to pull the same at increased speed the power of the engine must be increased, with a corresponding increase in size, weight and cost and getting outside the limits of the small economical tractor.

With the diagram is presented also a table, Table A, giving the speed in feet per minute and the pounds pull per horsepower at certain tractor speeds from 1 m.p.h. to 6 m.p.h. Also there is given a table, Table B, by which may be computed by counting the revolutions of the drive wheels, provided it is of one of the diameters given in the table, what the tractor speed is. Having determined the speed, by using the other table, one easily can approximate number of pounds pull at the drawbar of the tractor.

Diagram 2

In order that such information may be of some practical use there is presented also a diagram, Diagram 2, showing the increase in draft for a plow bottom of 12, 14 or 16-in. cut, brought about by the varying resistance of different kinds of soil. This diagram is based upon the commonly accepted soil resistance table which follows:

The resistance per square inch of furrow slice to be overcome in plowing soil with the characteristics given is:

Sandy soil	3 lb.
Corn stubble	3 lb.
Wheat stubble	4 lb.
Blue grass sod	6 lb.
June grass sod	6 lb.
Clover sod	7 lb.
Clay soil	8 lb.
Prairie sod	15 lb.
Virgin sod	15 lb.
Gumbo	20 lb.

Table A

SPEED AND DRAWBAR PULL

National Gas Engine Association

M.P.H.	T.P.M.	LB. PULL
1	88	375
1¼	110	300
1½	132	250
1¾	154	215
2	176	187
2¼	178	167
2½	220	150
2¾	242	137
3	264	125
3¼	286	116
3½	308	107
3¾	330	100
4	352	94
4¼	374	89
4½	396	84
4¾	418	79
5	440	75
5¼	462	72
5½	484	69
5¾	508	65
6	528	63

Table B

DETERMINING SPEED BY DRIVE WHEEL REVOLUTIONS

M.P.H.	TIMES PER MINUTE			
	48-in.	52-in.	56-in.	60-in
1¾	12	11½	10½	9½
2	14	13	12	11
2¼	16	14½	13½	13½
2½	17½	16	15	14
2¾	19	17½	16½	15½
3	21	19½	18	17
3¼	22½	21	19½	18½
3½	24	22½	20½	19
4	28	26	24	22½

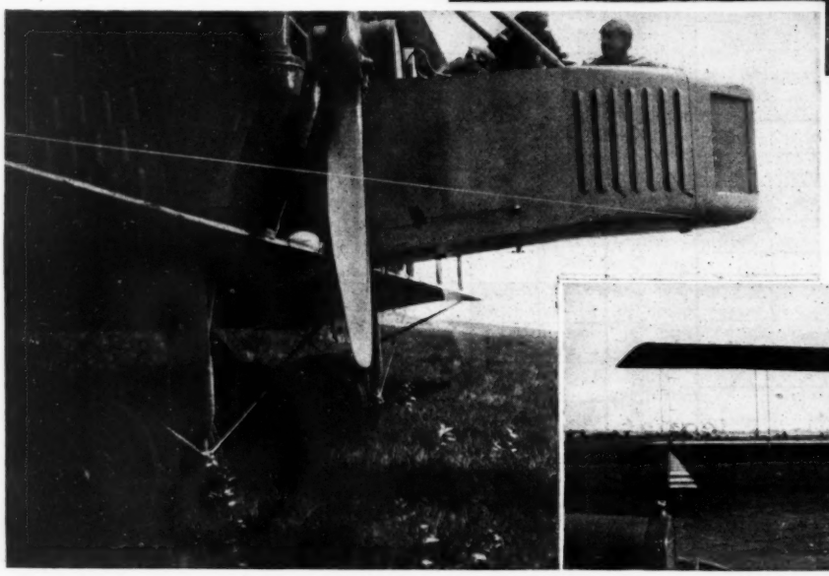
Another factor which must be taken into consideration when figuring on the effect of an increase in tractor speed when plowing is the increased friction induced in soil of any character by the increased speed. Just what the coefficient of this increase is nobody yet ever has figured out satisfactorily, but that it is large is certain. Thus, even though a tractor of given rate might pull a number of plows under normal conditions of soil and speed, and even if it were not true that the drawbar efficiency of the tractor were reduced by an increase in speed, the increased friction of the plows because of more rapid movement through the soil would make a difference that materially affects efficiency.

Increase Is Mistake

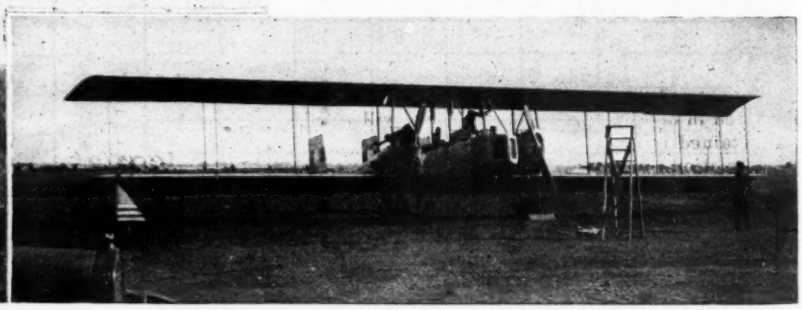
It must be evident, after what has been said, and especially in the light of what experienced manufacturers have to say, that to increase the speed of tractor plowing must be a mistake. The S. A. E. recognized this fact when the society recommended that 2⅓ m.p.h. be accepted as the standard speed for plowing tractors. Not many manufacturers have as yet accepted this recommendation, and it is likely that for a long time to come the old standard of 2½ m.p.h. will be used. Tractors and plows both are designed at present to do their best work at or about this speed and any attempt to introduce other speeds will be a mistake.

New American-made Caproni Airplane with Liberty Engine

Here are three views of the Caproni biplane, which is made in the United States and is equipped with a Liberty engine. Italian officials frankly state that the Caproni is considerably improved by the use of the Liberty engine instead of the Fiat 300 hp. with which it is equipped in Italy. The reason for the improvement lies in the additional 60 or 70 hp. furnished by the Liberty engine. The Caproni is equipped with the Liberty engine used in seaplanes,



which is not to be confused with the engine used in our battle-planes. The engines are similar, but the horsepower of the seaplane engines is about 360, while the horsepower of the military engine is approximately 450. Maj. Gen. William L. Kenly, chief of the Department of Military Aeronautics, United States Army, is seated in the machine which is shown in the center picture



U. S. Motor Transport Corps Has Been Created

Presidential Order Reinstates Old Organization Over All Automotive Vehicles Except Ambulances, Tanks and Tractors

WASHINGTON, Aug. 23—The Motor Transport Corps of the United States Army, completely controlling all motorized vehicles excepting "caterpillar-type" tractors, has been formed by a Presidential order. This department is directly responsible to General Peyton C. March, Chief of Staff, and to the General Staff. It is headed by Brig.-Gen. C. B. Drake, formerly a colonel under Brig-Gen. Chauncy D. Baker, who was in charge of the original Motor Transport Section of the Quartermaster Department. The new order abolishes the present Motor Transport Service of the Quartermaster Corps, which is headed by Col. Fred Glover.

Glover to Remain

Colonel Glover will remain with the Quartermaster's Department. Col. E. S. George, who was second in command under Colonel Glover, will be transferred back to the Signal Corps or possibly to the Air Service. Col. James F. Furlow, who was lieutenant-colonel under General Baker, will be second in command of the new corps. Colonel Furlow is now a colonel in the General Staff and will be detailed from it together with Lieut.-Colonel Seamon to the Motor Transport Corps. Lieut.-Colonel Seamon will be third in command. It is likely that General Drake will have title of director and Colonel Furlow, deputy director. It is considered probable that the original AA ¾-ton truck and the A 1½-ton truck will be reinstated in the program and will be ordered in large quantities. The B 3-ton truck, of course, will be retained.

The new corps will have complete charge of the technical supervision of all motor vehicles, design, production, procurement, storage and supply of them and the parts and their operation and maintenance and salvage. Provision is made in the order giving complete control of all motorized vehicles to the corps except those used for special purposes by various Army departments, such as ambulances for the medical department, over which the Motor Transport Corps will merely maintain supervision after they have been produced and delivered to the medical department.

The Motor Transport Board, which was created earlier this year and is composed of a representative of each Army division interested in or using motorized vehicles, will be retained to participate in the design or construction of vehicles by suggestion. Officers of the Motor Transport Corps will be detailed to each army division, corps and department to be in command of the Motor Transport Corps within the limits of that division.

All existing contracts for motor vehicles, motor vehicle equipment and supplies, maintained, operating and repairing of motor vehicles will be taken over by the Motor Transport Corps, which will make all future purchases and disbursements.

This complete reorganization and shake-up is pregnant with significance. It marks the end of a year which has been filled with upheavals in the military truck field. A year ago the military trucks and other motorized vehicles were under the control of the Motor Transport Section of the Quartermaster Corps, chief of which was General Baker. Christian Girl was in charge of production. In the summer of 1917 General Baker assisted by numerous engineers from the industry gathered the designs for three types of trucks to be manufactured by truck makers of this country and which were regarded as trucks especially designed for our Army. They comprised the AA ¾-ton, the A 1½-ton and the B 3-ton models.

The B truck, which was designed and completed first, was known as the Liberty truck. First models were delivered in Washington late in 1917 and received officially by President Wilson and Secretary of War Baker. Eighteen thousand of these have been ordered and more than 10,000 delivered. They are regarded as trucks equal to anything. Opposition developed to the standardized trucks, as these were known, because of their standardization of parts and uses. Some truck manufacturers claimed that the trucks were not equal to their privately-made commercial trucks. Some objected to the low margin of profit. Others were anxious to foist their own products on the Government.

There was considerable propaganda. Many and varied tales were told about the stability of the trucks. Politics were played. Changes in organization came. The Motor Transport Service was formed a few months ago and tests were held of all makes of trucks. The B truck was retained under the new regime. The original A was discarded and replaced by the White 1½-ton truck. The original AA was discarded and replaced by the G. M. C. 3-ton.

After ten weeks of control the Motor Transport Service has been disorganized in part and the old organization reinstated.

The organization which was under Mr. Girl, who resigned last spring, is to be retained by General Drake. Capt. E. R. Finkenstadt will remain in charge of class B truck production; George Randles will supervise operation; Captain Miller will retain control of production of passenger cars, trailers, motorcycles and bicycles; and Guy Morgan will have charge of spare parts, tires and accessories purchases. D. C. Hess will remain in charge of priorities. The various branch offices of Chicago, New York, Cleveland and Detroit, it is expected, will be retained in their present form.

Rebuke to Lobbying

The new order is regarded here as decisive and as a rebuke to those in the industry who have interfered by lobbies and politics during the last year with the motorization program of the Army. These will find the new organization entirely beyond their control. General Drake has been connected for many years with the military motor truck development and problems. He is, by the new order, directly responsible to the Chief of Staff, and since the order creating the Motor Transport Corps and appointing General Drake was signed by the President and the Secretary of War these two high officials are practically in a position of vouching for him. Consequently, as a high Army official put it today, "The election is now over," and hereafter it may be expected that motorized vehicle purchases, procurement and production will be conducted without outside influence and that those individuals in the industry who persist in using political methods may expect scant consideration.

The steam and electric railways are inadequate for our transportation needs. The Motor Car fills the gap.

Over the Top
in
Service and Repairs

Converting War-Day Failures Into War-Time Success

Article 2—Bookkeeping and Accounting System

By T. P. BOWMAN

SIMPLICITY is the main consideration of an up-to-date accounting system, but it is not a simple matter to construct one that embraces simplicity and completeness. However, after years of experience I find that the one described herein embodies all our requirements and is not limited to any certain amount of daily business. This system will handle nicely, in detail, your daily transactions regardless of whether they amount to $20 a day or $5,000 or $6,000. It is so simple that anyone who can write and figure can make an accurate accounting, and it is so arranged that the actual figures show your actual condition every day.

Must Be Continued

Beginning this system, let it be distinctly understood before proceeding, that once begun it must be continued from day to day, and furthermore do not hesitate to begin it, thinking you do not understand it, because it will be thoroughly explained to you.

Take form No. 1 to the printer, or if there are several printers take it to each of them and obtain their price per thousand for the printing and ruling of it. After you have obtained a satisfactory price, get them busy on it and insist upon having it completed as quickly as possible because our system cannot go in effect before we have a day sheet to work on.

You will notice that I have outlined eight departments on the day sheet, namely, individual, repairs, repair parts, accessories, tires, gasoline, cash and miscellaneous. The number of departments and the headings must not be regarded as standard. They must meet your requirements based on the size of your business and the number of distinctive lines carried. For instance, if you have the agency for a certain car, the day sheet should have a department for it. If you handle second-hand cars on a fairly large scale, a department should be figured for it. If you desire to keep your bank account separate from your cash account, have a department for each one. The keeping of these accounts separately is greatly to be desired.

In the way of guiding you to decide what your day sheet should contain, I will list a number of departments common to our business.

Individual—This column cannot be omitted. Neither can the cash, bank or miscellaneous columns, so disregard them as probable omissions.

Repairs—Repairs may be subdivided into several divisions, such as motor car repairs, vulcanizing, battery repair, etc. Unless these divisions are of good size it would be advisable to include them under the one head.

Parts—Under this head motor car parts only should be listed.

Accessories—This should include practically everything in the way of parts and accessories except standard motor car parts.

Tires and Tubes—Under tires tubes only should be included.

If you are handling trailers or tractors, a special column should be had for them. In fact, if you are specializing in any particular branch of work other than that listed, a department on your day sheet should represent it.

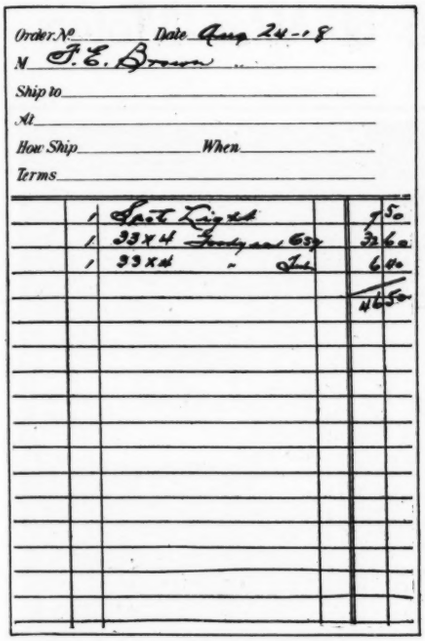
Using Day Sheet

After having decided the layout of your day sheet, next comes the practical using of it. Every day should be started with a new sheet and the month, day and year should appear on the opening sheet.

DAY SHEET Aug. 2d 1918

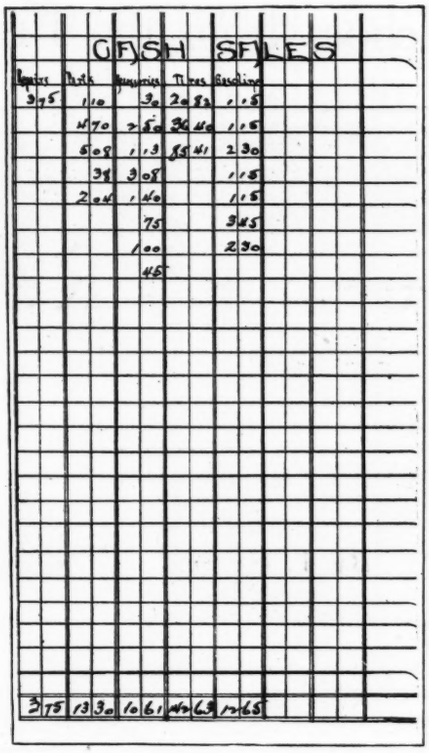
Name / Description	J	Individual Dr	Individual Cr	Repairs Dr	Repairs Cr	Repair Parts Dr	Repair Parts Cr	Accessories Dr	Accessories Cr	Tires Dr	Tires Cr	Gasoline Dr	Gasoline Cr	Cash- Dr	Cash- Cr	Miscellaneous Dr	Miscellaneous Cr
John Doe																	
1 Front Tube		3 75			3 75												
1 Cut Tire patch		1 10					1 10										
2 Spare Tires									7 00								
8 Gal Gas		1 15		8 00									1 15				
F. E. Brown																	
1 Set Tires		7 50							7 50								
1 32 x 4 Tire		3 60									3 60						
1 32 x 4 Tube		6 00		11 50							6 00						
J. Smith																	
Repairs				4 00											4 00		
Expense																	
Sec Rutter Loads		11 70															
Model Ry Co.																	
To Sec Rutter Loads				11 70													
U S Supply Co.																	
To Sec Jan Bills		21 60				57 60		37 60									
Jas Perry																	
By Bills as do				21 60	21 60												
Cash Sales																	
		46 00	47 63	37 60	3 75	57 60	1 10	37 60	7 50		3 60		1 15	4 00			

Form No. 1, the day sheet, offers a simple method of keeping a correct and complete daily record


Order No. _____ Date Aug 24-18
M. F. E. Brown
Ship to _____
At _____
How Ship _____ When _____
Terms _____

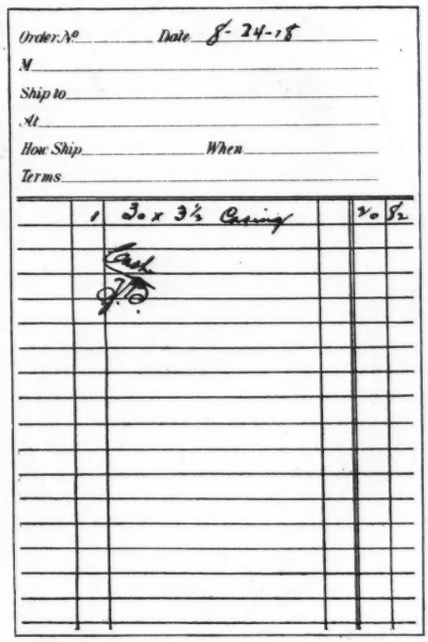
1	Set Lights		7 50
1	33x4 Firestone Cl.		32 60
1	33x4 " "	Tube	6 40
			46 50

This is form No. 3, which is used with the day sheet


CASH SALES

Repairs	Parts	Supplies	Tires	Gasoline	
3 75	1 10	30	20 83	1 15	
	4 70	2 80	36 40	1 15	
	6 08	1 13	85 41	2 30	
	38	3 08		1 15	
	2 00	1 40		1 15	
		75		3 45	
		1 00		2 30	
		45			
3 75	13 30	10 61	40 63	13 65	

Form No. 2 is the cash sales sheet shown here


Order No. _____ Date 8-24-18
M _____
Ship to _____
At _____
How Ship _____ When _____
Terms _____

1	30 x 3½ Casing		20 82
	Cash		
	J. B.		

Form 3 when a customer makes a cash purchase

In conjunction with the day sheet, form No. 3 is necessary. It is not a special form and any similar pad will do. Bear this in mind—not one transaction should pass without being noted on one of these slips. The repair work is not included in this order as the shop orders, when turned in to office, give a record of all labor charges. The shop orders will be treated later.

A Few Examples

A few examples of how to commence your new system: Suppose customer John Doe purchases tools to the amount of $4.50 and one tire at $24. The clerk immediately lists the articles on form No. 3. John Doe does not pay cash for this purchase, so the slip is marked "charge" and delivered to the bookkeeper. The bookkeeper in posting the slip takes day sheet form No. 1, enters the name, John Doe, in the same manner as appears in the illustration. Then immediately beneath the customer's name are listed the articles purchased, which in this case are

Tools .....$ 4.50
Tire ..... 24.00 $28.50 Total

Under the individual department in the debit column, the total $28.50 is listed. The individual column is for the exclusive use of customers' charges and credits. In this system the total of all debits must equal the total of all credits. So far you have a debit of $28.50, therefore a credit of $28.50 must appear on the day sheet to complete the entry. As a general rule, tools are carried under the accessory column, so it becomes necessary to give accessories credit for the amount by listing $4.50 in the credit column of the accessory department. The same is to be done with the tire at $24. Now your debits equal your credits. Suppose that James Brown, a customer, owes a certain amount of money and he goes to the cashier or bookkeeper with a payment of $20. The cashier enters James Brown's name on form No. 3 and writes as follows:

Credit by cash, $20.

Mr. Brown is given the original as a receipt and the duplicate is placed on the spindle until it is convenient to post it on the day sheet. At this time James Brown's name is treated the same as John Doe's, but instead of listing the $20 in the debit column of the individual department it is listed in the credit column, because he is to receive credit on his account. Now we have a $20 credit, but no debit to offset it. It is unnecessary to state that this transaction has to do with the cash department, inasmuch as cash was received. Since it has been said that a debit is needed to offset the credit, we know that cash must be debited, but that really does not explain why cash should be debited. The inexperienced bookkeeper sometimes figures that when cash is received, cash should be credited, which, of course, is wrong. We might refer to cash as a customer. If you give a customer $20 in cash or merchandise you would debit him $20. Cash is no more or less than a customer. The $20 received from Brown was given to cash, consequently cash must be charged with it by entering $20 in the debit column of the cash department.

These few examples are given only to show you the simplicity of the day sheet and also to show the accuracy and completeness of your records at the end of each day.

Are You KEEPING UP with THESE ARTICLES? If Not Why Not?

Form No. 2

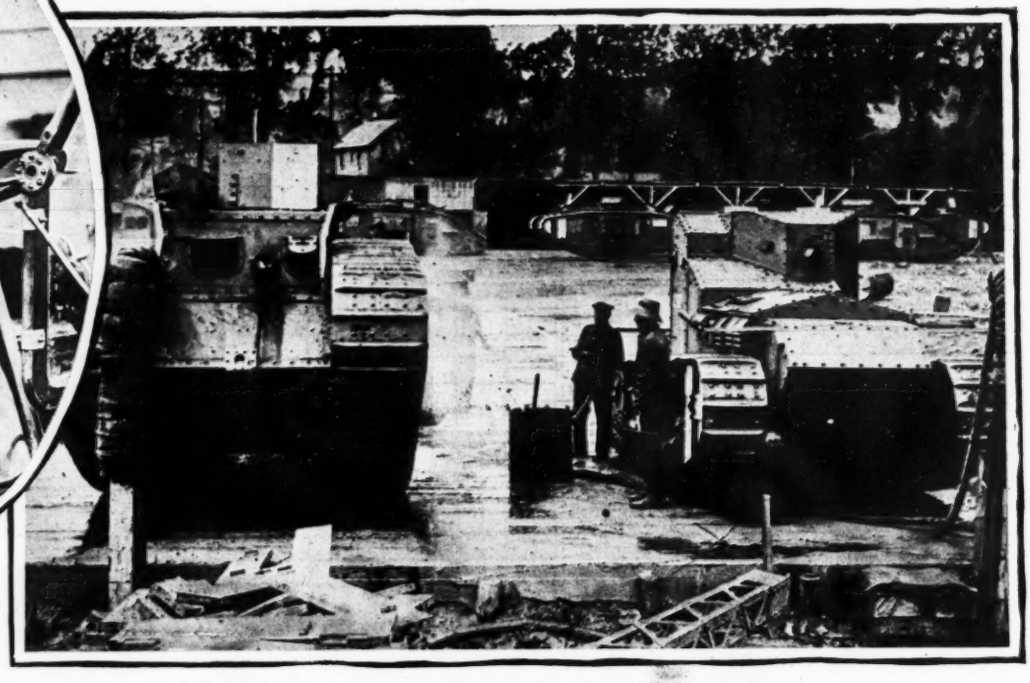
The cash sheet, form No. 2, is used for posting all cash sales at the end of each day. The totals of this sheet only are posted on the day sheet.

The next issue will show a full day's business fully taken care of from beginning to end and will be so explained that you can immediately commence your new system.

Let me remind you again of the importance of having your day sheet outlined immediately and also your cash sales sheet, form No. 2. Form No. 3 is a common form used in drygoods stores, grocery stores, etc., and can be obtained easily. Forms No. 1 and No. 2 must be furnished by your printer.

Echoes from the Field of War Motors

Here is shown one of the first woman chauffeurs in Japan. Yes, the Nipponese are doing it, too—releasing men for war service by substituting women



Washing the mud off of tanks after the battle on No Man's Land. Two types of tanks are shown. In the rear are the sheds which stable these motor steeds

These are American soldiers with American motors—a detachment of United States marines photographed soon after their arrival in a village in France ready for duty. It looks as if they were about to "crank 'er up"

Motorless Sundays Asked East of Mississippi

Fuel Administration Urges Abandonment of Non-Essential Use of Gasoline on the Sabbath—Rigid Weekday Conservation Also a Requirement

WASHINGTON, D. C., Aug. 28.—Special telegram.—All use of gasoline on Sundays not directly essential is to be discontinued east of the Mississippi river at the request of the Fuel Administration. Patriotic owners of motor cars, motor boats and motorcycles are asked to let their vehicles rest on the Sabbath, except for errands of necessity. It also is asked that most rigid economy be observed in use of fuel on week days.

Greatly increased war needs in France have rendered this step necessary for a limited period to safeguard against a possible shortage, according to the statement from the Fuel Administration. This motorless Sunday request has been rumored from time to time recently, but reassuring denials from the fuel board heretofore have given the impression that no such action was in immediate contemplation. Consequently the request issued last night was unexpected.

The request has not been couched in the terms of an order, but with the motor owners at large it will and should have that effect.

No definite time limit is set on the motorless Sundays, but they will probably be in force for several weeks. Even taxicabs are to be stationary during the gasless Sundays.

Vehicles permitted to run include tractors and trucks transporting freight, physicians' vehicles in professional duties, ambulances, fire apparatus, public service repair apparatus and motor vehicles on errands of necessity in the country where other transportation is not available.

It is estimated that in Chicago alone the number of passenger cars that will be affected by the request is more than 250,000. The average consumption of a car on Sunday, it was said, is six gallons. Stopping of 250,000 cars for the day would save 1,500,000 gallons. Gasoline is now selling at retail at 26 cents a gallon. The saving to motorists in a day would be $390,000. This figure is believed by others to be too high.

If the request continues in effect for four weeks the saving would be 6,000,000 gallons and $1,560,000.

More than 1,600 taxicabs in the city are affected by the request, and through the taxicabs more than 5,000 chauffeurs, mechanics, starters, telephone operators, etc., who will have have a day of rest. Hundreds of private chauffeurs will be similarly relieved of labor on Sunday.

Here Is the Fuel Administration's Appeal to Motor Owners:

"The United States Fuel Administration considers it necessary that a limited conservation of gasoline be undertaken in the States east of the Mississippi River in view of the increasing demand for gasoline for war purposes and the paramount obligation of meeting promptly and fully all overseas requirements.

"An appeal is made therefore to the people of the United States east of the Mississippi River to exercise rigid economy in the consumption of gasoline during the next few weeks as a necessary and practical act of patriotism.

"War necessities are being and will continue to be promptly and fully met, but this is the period of the year when consumption of gasoline is at its highest, and the increased domestic demands, together with the extensive military operations in France have rendered necessary, for a limited period, the adoption of safeguards against possible shortage.

"In view of the difficulty, if not the impossibility, of differentiating between the various uses to which automobiles are applied, the United States Fuel Administration believes that the greatest measure of economy can be effected with the least interference with the business of the country through the discontinuance of the use of all classes of motor vehicles, motor boats, and motorcycles on Sundays.

"The United States Fuel Administration therefore requests that in the section of the United States east of the Mississippi River there shall be a discontinuance of use of the vehicles above specified, including all such as are operated for hire, on each Sunday hereafter until notification that the need for such discontinuance has ceased.

Some Exceptions

"The following exceptions are made:

"1. Tractors and motor trucks employed in actual transportation of freight.

"2. Vehicles of physicians used in performance of professional duties.

"3. Ambulances, fire apparatus, police patrol wagons, undertakers' wagons, and conveyances used for funerals.

"4. Railway equipment using gasoline.

"5. Repair outfits employed by telephone and public service companies.

"6. Motor vehicles on errands of necessity in rural communities where transportation by steam or electricity is not available.

"In addition to the above, appeal is made to the patriotic men and women of America, east of the Mississippi River, to undertake voluntarily additional conservation in the operating of their own automobiles, wherever possible.

"The United States Fuel Administration believes that all consumers of gasoline will observe the spirit of this request. In that event no mandatory order governing the use of gasoline will be necessary."

EDITORIAL

The Fuel Economy Ace

THE ace system of gasoline economy developed by the New York coach company is one example of real practical fuel conservation that appeals to every user of gasoline. It appeals because it is simple to put into operation and positive in its results. As a spirit of the war and as an example of the war spirit that everybody should show nothing better could be desired.

HOW much better is this system than one in which the use of the vehicle would be restricted in order to save fuel. The restriction method would save fuel but it would reduce the usefulness of the service.

THE coach company has not reduced its service one iota but incidentally it has got each of its 250 buses saving over 13 gal. of gasoline per week. This is positive conservation. This is useful conservation as compared with negative conservation.

RESTRICTIONS cannot always be looked upon as economies. It could not in the practical sense be considered an economy if the transportation system of a great city like New York were interfered with. The loss of time to business men might be worth a thousand times more than the saving in gasoline. But when you can get the economy without detracting from the service rendered then you have done a real war job. That is the kind of war jobs that our boys are doing in France. That is positive conservation.

THE appeal in this positive conservation scheme of the coach company is that every motor truck user in the country can apply it. There is not a driver of a truck but who can coast a little more. He can approach stops a little more rationally and save gasoline as well as brake lining, which incidentally is a rather scarce commodity. There is not a driver but can give a little more attention to spark plug points, to breaker points and to compression and carbon. Too few realize exactly the economies that such attentions effect. The economy with an individual may appear almost infinitesimal, but like the drop of water or the grain of sand, it becomes a mighty factor in the aggregate. The ocean is made up of drops of water and the mountain of grains of sand. In war times we should more fully recognize our duty as a part of a people of 103,000,000 population. What you or I may save may seem very small, but what 100,000,000 save is an enormous quantity. If every one of the 5,000,000 motor car owners would make up his mind every time he rode in a car or drove one to do his part on fuel economy we would be doing a wonderful service in the saving of gasoline.

Computations in Conservation

WHEN a farmer reports that he has driven his car something more than 8000 miles and considerably less than 1000 of this was for anything that could by any stretch of the imagination be called for pleasure purposes, you would put that car down as a utility car, wouldn't you? This is what one—only one, mind you—of the farmers who use cars to help them conserve their time and, what is most important in these war days, man power reports to Kissel.

MAN power is becoming less and less, and the farmer is using machinery more and more to make up for the loss. The motor car does a good bit of that conserving for him, too, as well as the tractor.

ANOTHER way in which conservation is being augmented is through the dealer and, ultimately, the car owner. New noises or squeaks that formerly were ignored until they became shrieks, you might say, to-day are remedied immediately, and the beauty of it is the average owner is becoming competent to effect the remedy himself with the occasional aid of his dealer or service man. Just what this particular conservation amounts to can be realized from the following paragraph.

IF charges for an hour's service a day at 75 cents an hour were saved on the 5,000,000 motor cars and trucks in use in this country, the owners together could save $3,750,000 a day, or $1,468,750,000 a year. If through this education of owners a gallon of gasoline a day were saved, this would amount to 5,000,000 gal. a day, or 1,825,000,000 gal. a year. At an average price of 25 cents a gallon this would mean an annual saving of the small sum of $45,625,000,000, an amount nearly double that which Secretary McAdoo has asked for to conduct the war up to June, 1919.

SAVING on oil, tires and parts, time of mechanics, service men, etc., means additional unbelievable sums. Part of this saving is already under way. The motorist is becoming more proficient in the care of his car. This is partly because he cannot get his car cared for by the short-handed dealer or service station, partly because he has been educated to see the uselessness of letting a noise or squeak go unheeded, of failing to run his car most efficiently from the standpoint of gasoline consumption, of having his car laid up in a garage until its turn comes.

IT is very likely that the average motorists will have to do some other computations before all is said and done. The repairman and service man already are doing them, as well as the dealer proper. The need to conserve man power and resources is growing with the increase in the demands for the winning of the war, and nobody is more willing to help than the average owner and those who sell him his car and keep it in running order.

Make Use of Your Junk Pile

WITH the present high cost of steel it becomes necessary to use every bit of metal in the shop to the best advantage. Every shop has its junk pile—often a hopeless mass of broken valves, taps, drills, clevis pins, bolts, files, in fact, anything that pertains directly or indirectly to cars. It is possible to make good use of this material, however, and thereby hangs the tale.

THE dealer or shop foreman who is near sighted simply allows this varied mass to accumulate until he deems it enough to warrant calling the junk dealer. This might net him a few dollars and is all right where the parts are really beyond repair and the metal is not valuable, but a little work on the side often will reclaim a part that would be difficult to duplicate.

THE wideawake dealer who renders service, particularly to one make of car or truck, can benefit from his junk pile. Suppose he finds in his collection a crankcase broken in several places and with perhaps one of the arms off. During certain periods, when teaching a new man the art of welding, for instance, this crankcase can be repaired until finally it is in as good shape as a new one. All the dealer has to do then is store it. Then, sure as fate, some day along comes a car badly in need of a crankcase. The owner stops at this particular dealer—his car is handled here—and asks for a new case. The dealer remembers his spare case and puts it on, much to the satisfaction of the motorist, who is always in a hurry to get away.

LOOK out for waste in the repair shop. Too often drills are discarded just because they have broken off and it takes a little time to grind a new cutting edge. A short drill will cut just as well as a long one and is really desirable on some classes of work. Take the case of files. Files are made of very fine steel and when softened can be used to make parts requiring good steel. Many useful shop tools can be made from files, such as scrapers, screwdrivers, etc. Some very fine center punches can be made from square files that have been ground on the often will reclaim a part very difficult to duplicate.

TAKE valves, too. The stems of these are often good steel and it is short of a crime to let a junk dealer get them. Sometimes a warped valve of 1¾-in. diameter can be turned down in a lathe to an 1½-in. head and otherwise shaped so it can be used in some engine that may need just such a size.

BUT in order to profit from the junk pile the men in the shop must know what they have on hand. All the material must be classified. Bushings should be kept in one box, valves in another, ½-in. S. A. E. bolts in one compartment and ½-in. standard bolts in another and so on. Whenever a piece of tubing is cut a short piece may be left, which certainly should be saved, for it may make an excellent bushing sometime for a brake rod forked end or some similar part. By keeping a sort of mental record of what there is in the service box, let us say, it will be surprising how little is wasted.

A GOOD way to take care of this material is to make up about three boxes, say 2 by 3 ft. and 4 in. deep, divide them into about twelve compartments. In one box, which might be further divided, nothing but bolts, washers and nuts should be kept. Another might contain parts like valves, spring bolts, shackles, grease cups, etc. The third would take care of carbureter and electric parts. Arrange the boxes to run on slides under the bench and label each. This keeps them off the floor and prevents tossing articles in the wrong compartments, which means delay later on. Where a workman has to wade through a lot of unclassified junk the chances are he will give up the job and use a new part.

Speed in Tractor Plowing

SOME of the tractors on the market at the present time are capable of making a speed considerably in excess of that regarded as normal for good plowing. While it is a fact that there are some specially designed plow bottoms which permit a speed greater than that which has been conventional for years, there is danger, nevertheless, of laying too great stress upon this fact.

THE great advantage which the tractor gives the farmer in plowing lies not so much in the speed it will make as in its capacity for continuous work regardless of conditions. Especially is this the case in the fall when the tractor can untiringly work long hours under conditions of heat and insect annoyance which would seriously handicap horses if not make it impossible for them. Continuous plowing at a moderate speed is productive of far better results than can be attained by excessive speed under average conditions.

SOME of the tractors which are capable of great speed have caused their owners considerable trouble and expense in the harvest fields this year. Binders always have been drawn by horses and still are built with the limitations of animal power in mind. Some of the speedy tractors have shaken them all to pieces, and instances are known where new machines had to be bought with which to finish the harvest.

GREAT speed in a tractor may be an advantage, sometimes, but it is not an unmixed blessing. Dealers should exercise discretion in urging speed capacity as a sales argument.

TRUCK FLEET FOR FARMERS

Philadelphia, Pa., Aug. 23—The agricultural division of the local food administrators met with farmers and truck gardeners here and decided to look immediately into the feasibility of establishing a large fleet of motor trucks to make daily collections of vegetables and fruits and bring them direct to the new curb food market opened in this city.

The plan suggests that farmers within a radius of 25 miles of Philadelphia, who raise approximately 10 acres of garden truck, or have that much ground to cultivate for the purpose, deposit their foodstuffs at definite points agreed upon with the Food Administration. Motor trucks then will pick up the loads and deliver them direct to the curb market. The Food Administration under the plan would take charge of collections and deliveries. This would solve the problem of getting to market the large quantities of vegetables and fruits in Pennsylvania which are rotting for lack of proper distribution. The aim is to have this service for the smaller, or truck, farmer, who has no adequate transportation facilities but whose output is needed in Philadelphia.

GARFORD TRUCK PRICES UP

Lima, Ohio, Aug. 27—The Garford Motor Truck Co. increased the prices of its trucks and tractors Aug. 15 as follows:

Trucks

MODEL	TON CHASSIS	OLD PRICE	NEW PRICE
75C	1	$2,100	$2,500
66B	1½	2,500	3,000
66BL	1½	2,600	3,100
70B	2	3,000	3.300
70BL	2	3,100	3,400
77B	3½	3,900	4,300
77BL	3½	4,000	4.400
68	5	4,700	5,000
68L	5	4,800	5,100
69	6	4,900	5.300
69L	6	5,000	5.400

Tractors

70B	4½	$3,100	$3,400
77	7	4,000	4,400
68	10	4,800	5,100

FOR BETTER OR WORSE

Boston, Mass., Aug. 24—"Plan for the worst; hope for the best."

This is the motto several Boston dealers have accepted regarding the future of their business. Some of them are working out plans along the former lines and have told their salesmen that the outlook was poor and they could have leaves of absence or get other positions. Others are working on different lines. They are reducing their overhead but plan to stick to business and keep a good working force going, figuring that even if they have to handle used cars solely they can make a living on that or lose a few thousand dollars.

Meanwhile they argue that by keeping in business at a loss when the war ends and burdens lighten up, embargoes are lifted, etc., they will be in the middle of the stream ready to steer their craft along, while the fellows who quit will have to begin all over again, at a much greater cost than if they stuck it out.

Report Condemns Past Air Work

Senate Committee Blames Personnel of Board and Recommends Creation of Aeronautic Ministry

WASHINGTON, Aug. 23—The most important findings of the Senate Military Affairs Committee, as contained in the report of that committee issued here yesterday are:

A substantial part of the airplane appropriations have been wasted.

No battle, bombing or fighting planes have been produced to date.

Placing and subsequent withdrawals of orders for planes and engines have been frequent occurrences.

Experimental fields were selected injudiciously by biased opinion.

Profit for the manufacture of airplanes and engines is excellent but is not yet perfected to a proper degree.

Our Allies have been unable to deliver the requisite number of airplanes because we have failed to supply them with raw materials.

Our training fields are excellent.

The original Aircraft Production Board is responsible for the delays, procrastination and lack of responsibility, expert knowledge and decision.

The present air service executives are performing excellent work but lack efficiency because of possible differences of opinion.

Air Ministry Wanted

Recommendations of the committee include: An Air Ministry headed by a Secretary as a member of the President's Cabinet.

Commissions of engineers and pilots to work in relays of observation between America and the front.

Details of the delays and of the frequent countermanding of orders and conflicting of orders.

Six hundred and one De Haviland 4 airplanes equipped with Liberty engines had been shipped to France up to Aug. 1, according to the report, which says that $6,500,000 was expended on the Bristol fighter which was then discarded.

Three chief causes are named for the disappointing airplane results, namely:

1—The airplane program was placed in the control of great motor car and other manufacturers who were ignorant of aeronautical problems.

2—These manufacturers undertook the impossible task of creating an engine which could be adapted to all classes of flying craft, and subordinated our air program to that engine.

3—We failed at the beginning of the war to adopt the approved European types of airplanes which should have been done coincident with the production of the Liberty engine.

The committee states this brief summary is not a wholesale condemnation of our airplane production. Much has been accomplished. The committee reports that while it believes there are many things to be remedied, nevertheless we are approaching a period when quantity production may be hoped for.

In summarizing the report states that on April 6, 1917, we entered the war, and on June 8, 1917, an announcement was made that a fleet of 25,000 airplanes was to be created.

On July 24, 1917, $640,000,000 was appropriated to carry out the aircraft program, which fund has been exhausted either by actual expenditure or commitments.

A further appropriation of $884,304,758 has been found necessary.

In the opinion of the committee a substantial part of the first appropriation was practically wasted. While much good work has been accomplished, for which the committee states due credit should be given, it must be admitted that our airplane program up to the present presented many aspects of failures. While an army of 3,500,000 men has been made, the air craft situation is as follows:

Our attempt to create a fighting plane was centered in an effort to adopt the Bristol fighter and the De Haviland 4 to the Liberty engine. The Bristol was put into quantity production without sufficient test and over $6,500,000 was expended and the lives of several men sacrificed when the machine was condemned and its manufacture discontinued.

After more than 1200 Standard J training planes equipped with a Hall-Scott engine had been manufactured, at a cost of $6,000,000, the machine was condemned as dangerous and placed in storage.

An oral order was given the Curtiss Aircraft Corp. for 3000 Spad machines early in December, 1917, and later in the same month, Col. Clarke and Major Jesse G. Vincent found that the machine could not be operated with a Liberty engine. On Oct. 8 of the same year the contract was cancelled, the reason given being that the single-seater fighter was obsolete; but, states the committee, on April 23, 1918, contract was let to the Curtiss company to build 1000 S E 5, the English equivalent of the Spad. The cancellation of the Spad contract and the failure of the Bristol left us without a single- or two-seated fighter except the De Haviland 4 which we are equipping for reconnoitering, although it was originally designed as a fighter.

As early as October, 1917, we were in possession of the facilities for construction of the Caproni planes. Expert Italian engineers have been here since June, 1918, but we have up-to-date constructed only one Caproni plane. Nearly a year has elapsed since we might have begun work on these machines and by this time should have been in quantity production.

The Handley-Page bombing plane is another example of our delay. Plans were furnished the Signal Corps as early as the summer of 1917 and contracts were being made until February, 1918. Delivery on these was not begun until August, 1918. The first Handley-Page plane was flown last July. Tests are not yet complete.

Liberty Engine Approved

The Liberty engine is approved by the committee but is said to be imperfect yet, though rapidly approaching perfection. The committee complains that fighting planes have not been built around the Liberty engine and that our aircraft program will not be complete until one is. Only 2114 airplanes have been delivered to our army in France by our Allies.

The profits on the Liberty engines by our manufacturers are said to run as high as 34 per cent and on the Liberty engine aluminum pistons as high as 285 per cent on the capital invested. Numerous examples are told of in the report of the placing of contracts and their subsequent withdrawal to show the indecision existing with the original Aircraft Production Board.

The report condemns the construction of the McCook field at Dayton as an experimental field and of the Wilbur Wright field. The committee states that it feels obliged to note in this connection that shortly before negotiations for the McCook and the Wilbur Wright fields were completed Col. E. A. Deeds, a member of the aircraft board, was the owner of the first and a part owner of the second. He sold and transferred them to interests with which he had been identified. The committee states the number and amount of contracts for planes and engines assigned to concerns at Dayton and Detroit, and the number and collection of aviation fields at Dayton could not fail to attract the attention of the complete senate committee. Due to the vast motor car industry, Detroit doubtless possesses more facilities for gas engine production than any other American community.

Industrially considered, the concentration of a great number of these two pursuits in these two cities may perhaps be justified but the committee is forced to the conclusion that the personnel of the aviation board from its formation to its reconstruction explains the fact.

WHEEL MAKERS ORGANIZE

Toledo, Ohio, Aug. 23—The Association of Automotive Wheel Manufacturers was formed here this week when twelve concerns, representing practically all makers of wire, pressed steel and cast steels, met for the purpose of closer co-operation. Some of those present represented the wood wheel makers. The object of the association is the investigation and promotion of engineering and mechanical problems of automotive wheel manufacturers. A committee of three has been appointed to draft plans for a permanent organization which will be taken up at a meeting in September.

Text of Letter from War Industries Board to N. A. C. C.

SUPPLEMENTING our letter to you of the 9th instant we beg to advise that we have now received most of the reports embodying the data and information which we requested you to furnish us and have given these reports careful study and consideration. From them it appears that the stocks of raw materials and of semi-finished material in the hands of manufacturers of passenger automobiles, while large, are greatly unbalanced, with the result that these large stocks, aggregating approximately $150,000,000, cannot be liquidated until they have been matched up with other materials necessary to manufacture the completed cars.

The conclusion has been reached that it is in the public interest, as well as in the interest of your industry, that it be assisted as far as practicable without interferring with the war program in the liqwidation of the stocks now on hand and to that end the Priority Division of the War Industry Board will accord a degree of preference designed to accomplish this result to all manufacturers of passenger automobiles who will subscribe to a pledge to be prescribed by the Priorities Commission embodying in substance the following:

1—That the manufacturer will limit its purchase of materials, equipment and supplies to such as are absolutely necessary to match up its stocks now on hand.

2—That its production of passenger automobiles and all repair parts therefor shall not for the six months ending with Dec. 31, 1918, exceed 25 per cent of its production for the calender year 1917.

3—That it will conserve and economize in every possible way its stocks of iron and steel and their products now in its hands or that may come into its possession and will release on request of the War Industries Board to such other manufacturer of passenger automobiles as may be designated by the said board such of its stocks as can be utilized by such other manufacturer and which are not required by it for either the limited production above specified or for war work.

4—That it will from time to time render such reports of its activities under oath or otherwise as may be called for by the War Industries Board.

The War Industries Board will, in carrying into effect the terms of the pledge herein provided for, use as a basis as far as applicable the sworn reports recently rendered it in pursuance of its request.

In justice to the passenger automobile industry we feel again impelled, as the situation appears to us now, to frankly repeat our statement to you of Aug. 9 that the urgent war requirements for iron and steel are so great that the probability of your industry procuring iron and steel after Jan. 1, 1919, for the manufacture of passenger automobiles is so uncertain that we again urge the members of your industry to as rapidly as possible utilize your facilities for the productions of direct and indirect war requirements, not only in the interest of the Nation but in the interest of your industry itself. In such effort the members of your industry will have the active and whole-hearted co-operation of the Board.

Limited Steel for Passenger Cars

War Board Will Permit Production on the Basis of 50 Per Cent for Rest of Year

WASHINGTON, Aug. 26—Special telegram—Passenger car manufacturers will get sufficient steel to balance their inventories for a production, during the last six months of 1918, equal to 50 per cent of the production in the same period of 1917. Those who have more steel than this allows will turn over their excess supply to other motor car factories which need it to complete their production.

The makers further are pledged to purchase no materials, equipment or supplies other than those absolutely needed to match the stocks on hand. Upon meeting these conditions the manufacturer's requests for steel will receive preferential treatment from the Priorities Division of the War Industries Board. No decision has been made regarding further supplies of steel to the industry following Jan. 1, 1919, but the board in its letter to the National Automobile Chamber of Commerce, setting forth the preceding, again urges the industry to use all possible haste in converting the plants for use in either direct or indirect war work.

Result of Meeting

These decisions by the War Industries Board are the results of a meeting between the board and Hugh Chalmers and Alfred Reeves, representing the industry. The agreement fully arrived at by the board was expressed in a letter sent to the N. A. C. C. and signed by Alexander Legge, Edwin D. Parker, J. L. Replogle and George M. Peek. The letter points out the fact that the inventories of raw materials and semi-finished materials in the hands of the industry aggregate $150,000,000 and that these cannot be liquidated without additional supplies of steel which will allow the makers to match up the various parts.

The magnitude of the industry, which had more than $1,000,000,000 in 1917, was one of the primary considerations which influenced the decision of the board, according to the members, which stated that it believed an industry of this size was entitled to all the assistance that could be given in enabling it to clean up its stock.

N. A. D. A. ISSUES WARNING

St. Louis, Mo., Aug. 24—The N. A. D. A. states that solicitation of members for the national association by representatives of "The Western Automobile Trade Association" of the Durham building, Denver, Col., is entirely without the knowledge of any officer of the N. A. D. A. Reports from Montana and other western states have it that representatives of this "association" have obtained membership applications from dealers, together with the membership fee, but that no communication from this "association" has reached the home office.

A salesman who is devoting much energy to the N. A. D. A. campaign has reported to the N. A. D. A. office that he met Ellsworth Ellis, who represented himself as "field manager and director of legislation" for "The Western Automobile Trade Association" and who avowed his purpose of "working to cement the motor car industry for common good." He had been promising dealers whom he approached much material benefit in the way of state and national legislation and freight rate protests. His promises were much more liberal than those of the national association. None of the memberships he obtained have been registered at the N. A. D. A. offices and no communication of any kind from Ellis or any of his associates has been received.

It has been informally reported that one man believed to have been connected with this association has recently been involved in car thefts.

N. A. D. A. ADDITIONS

St. Louis, Mo., Aug. 24—Membership applications received at the N. A. D. A. headquarters this week reflected somewhat the turmoil of the trade during the last week and the fact that President F. W. A. Vesper and Executive Secretary E. E. Peake were engaged in Washington in ironing out difficulties there, instead of seeking memberships. About 150 applications were received. Twenty-three of these came from Hartford, Conn., which is now more than 100 per cent, as the association has but twenty-two members. A miscount was made in sending in the applications and the local association now has one membership all paid ready for the next dealer who joins the local. Twenty-two memberships came from Youngstown, Ohio. The rest of the applications were individual, scattered over the entire country.

Service on the Farm Tractor

President of Avery Co. Says It Should Start at Factory in Making Machines Novice Can Handle Without Serious Mistakes—Giving Instruction—Field Work

PEORIA, Ill., Aug. 23—The matter of service in the selling of farm tractors is of first importance. The views of different tractor makers with regard to service are as varied as the design of their machines. Some tractor makers through their branch houses have a comprehensive service which is in addition to the service program of the dealer. The entire service question of the tractor hinges around the one fact that a tractor must be kept working when work is to be done and any delay holds up the complete movement of farm work.

Of the old implement manufacturers producing tractors in large quantities the Avery company of this city has done remarkable work in giving service and also is insisting on practically all its dealers giving prompt service and carrying an adequate stock of spares in order to give the farmer the promptest service possible.

Service Viewpoint

J. B. Bartholomew, president of the company, has been connected with the manufacture of automotive apparatus since its very inception, in fact, he did a good portion of the machine work on the original Duryea motor car built back in 1893. Mr. Bartholomew has expressed himself as follows on the question of service from the manufacturer's viewpoint, laying as he does special stress on schools that are conducted in different parts of the country for educating dealers and farmers as well in tractor mechanics:

"Service is one of the words that is used in the trade that seems to have a very elastic meaning, or perhaps better stated, each person in the trade looks upon this word from a different angle and applies their own sort of reasoning to it.

"From my angle and the angle of our company the word service has come to mean everything that its elasticity will stand for.

"Going back a few years we used to have a corps of operatives which were called experts. These were men sent out to instruct and make adjustments on machines, and as the business grew this corps of operatives grew until it became evident that the wrong term had been applied—that they were not experts, and that they were going to the trade to do work under a misrepresentation. We changed the title to servicemen.

"In my opinion the very first service work on a farm tractor is that which is done at the factory and which under all circumstances should be done at the factory, and that is to see to it that the machine is so constructed that a novice can handle it without making a serious mistake. See to it that in all its adjustments when it goes out to the field there is nothing fundamentally wrong in its design and construction. One man in charge of this kind of service with a corps of operatives to carry out the work before the machines leave the factory and the work that is being done based upon experience from day to day and from year to year with these machines and the reports received from the field, constitute the first important step.

"The next important step in service is to have a corps of teachers who thoroughly understand and who have been highly trained to go about the country and teach servicemen at the branch houses, distributing houses and all big centers, the mode of operation, care, adjustment and other details as to the tractor. These we call tractor schools. They are open to all comers, even though they be competitors or the employees of competitors, because we believe the wider spread this knowledge is the better it is for the industry.

"From each branch house and distributer there is sent out to the local dealers a teacher who gives instructions to the local men and their corps of operatives and service help and the user or operator, all of which service is free, as far as the Avery Co. is concerned. Therefore, having thus given instruction and detailed information that is required on the part of those who have to do with the practical operation of tractors, it is natural to expect that instruction in advance of the operating of the tractor has been pretty comprehensively dealt with.

"We now come to the service on the tractor after it has reached the field and the operator has put it into practical service. All of our local dealers have agreed in the contract to give this service free to the operator insofar as helping him to deliver the machine and put it into operation on his own place or wherever he intends to work it.

"Every dealer is urged to keep a sufficient supply of spare parts and repair equipment on hand for the use of his customers.

"We are now coming to the line of service that is available for the purchaser of Avery tractors who require it and who should and are willing to pay for it.

"We have a charge for doing various kinds of work that a farmer wants done on his tractor while he is at work on something else and by a man competent to do it, which he is willing to and should pay for. Such service refers to the grinding of valves, removing of carbon, adjusting bearings, etc. This class of service is sold to the customer the same as a new magneto, belt or any other part that might be required. To meet these conditions we maintain a sufficient number of servicemen in each branch house and distributing center and whenever they go out on a job of this kind the local dealer is expected to and usually does send his serviceman along to get all the information and instruction possible so that in the future if such work is required it can be handled with less expense."

CLAIMS POLICIES MISUNDERSTOOD

Akron, Ohio, Aug. 23—The Goodyear Tire & Rubber Co., in commenting on the charges made against it by the Federal Trade Commission, claims that it has not

Why Road Work Should Be Kept Up

required dealers to sell Goodyear products exclusively nor has it asked them to confine their services to Goodyear tires exclusively. The company merely has pointed out the necessity, from the consumer's standpoint, for this service and has insisted that dealers upon signing company's contract agree to render the agreed service. The company further claims that it has made no effort to curtail or control or restrict the operations of dealers, simply insisting that the consumer must be served.

The complaint of the Federal Trade Commission is based on a preliminary investigation. As yet the Goodyear company is not aware of the nature of the investigation and has not had an opportunity to explain the facts in the case. When this opportunity is presented, the company feels confident that all the items in the charge will be cleared up.

To the company the whole problem gets back to the sincerity of its service station plan and the motive underlying it. The company believes that if the Federal Trade Commission now knew that the whole aim and effect of the company's policy is to aid tire users to conserve tires, get more mileage and hence cut down tire expense, this complaint would not have been made.

Process of Work

The plan has involved some instruction to users, some education as to the proper use of tires to get the maximum service from them, some inspection of tires, etc. All this has meant personal contact with users, and this has necessitated the establishment of this service in convenient places.

Claiming to have based all its policies on thorough investigation, careful analysis and expert legal advice, the company feels certain that when the facts are known to the Federal Trade Commission the complaint will be dismissed.

ECONOMY IN MOTORCYCLES

Washington, Aug. 23—Representatives of the motorcycle industry, which was classed as essential earlier this week, conferred yesterday with the Conservation Division on a program to effect economies in the use of metals and rubber in the manufacture of its product. The manufacturers agreed to put their experts to work on technical problems connected with various methods of effecting economies and to report within a few weeks, through the War Service Committee, which is to be organized by the industry.

The industry consumes a considerable amount of steel, copper tubing, brass tubing, tin plate and rubber. The manufacturers were asked to suggest wherein it is practicable for them to use substitutes for the metals, particularly copper and brass, which are required in the war program. They agreed to give the matter careful consideration and to make suggestions to the Conservation Division that will form the basis for recommendations by the latter.

Representatives of the industry at the meeting were T. C. Butler, Jr., C. B. Franklin and F. J. Weschler, Springfield, Mass.; F. B. Rodgers, Arthur Davidson, W. S. Harley and August Frey, Milwaukee, Wis.; A. G. Hale and F. J. Stareck, Cleveland, Ohio.

Tractor Service from the Dealers in Motor Cars

Distributers in Kansas City Territory Prefer Them for Their Lines

Are Garagemen Missing a Good Chance for Trade?

IN the Kansas City territory tractor distributers are tending more and more to the selection of motor car dealers as tractor agents. Their preference for the motor car dealer is based upon the conviction that he will be more prompt in giving service and that he will feel more keenly the responsibility than will the old time dealers or even the garageman.

Tractor distributers have come to this way of thinking after a more or less unsatisfactory experience with garagemen in the matter of tractor service. Many tractor distributers, with their regular salesmen and service men busy delivering and starting tractors, a most important service, found it impossible to spare men from their staffs to answer service calls. In this dilemna some of them attempted to turn over local tractor service to garagemen who had the equipment for service and who presumably had the skill also. But this plan has not worked out so satisfactorily as to warrant dependence upon it, hence the tendency to eliminate the ordinary garageman from service and substitute therefor the better equipped and better organized motor car dealer.

In the opinion of a man well qualified to judge, the garagemen have made a mistake. Tractor service already could be an active and lucrative part of garage business, if the men in the business would sense it and rise to the opportunity. Up to the present time they either have fallen short in a realization of the opportunity presented, or, where they have rendered tractor service, they have gone about it in a tactless manner which has repelled rather than attracted farmers.

Garage Better Equipped

In the first place it is alleged that garagemen have not let farmers know that they have the equipment, skill and disposition to give service on tractors. The garageman is materially equipped better than is the average service man who can be sent from the central and sometimes distant distributive center. The latter at the best can carry but few tools, just enough for him to take care of the emergency jobs he encounters. In case of more serious trouble he must seek assistance, either for tools or help, from among local garagemen or machine shops.

The garageman, upon the contrary, always is within available reach. He has handy all the necessary tools and usually he has a service car or truck. He can be reached by the phone at any time and can be on the job within a short while. If his service car is not fitted with hoist, welding outfit, etc., to adapt it to tractor service, it very easily can be so equipped.

The thing which counts the most with the farmer is to have his tractor constantly in a condition to work. When it is put out of commission by some mischance which is beyond the skill of the farmer himself to remedy, unless he can get competent assistance speedily, the delay in his work may prove serious for him. No longer is it possible for the farmer to call upon the distributer for help in the assurance that it will be forthcoming immediately. The distributer as a rule can no longer give quick service. He has so many tractors in the field now that it is a physical and economic impossibility for him to give service on all of them. He must delegate it to a local man and the farmer must learn to call upon the local man instead of the distributer when he needs help.

As a rule the farmer does not know and understand that in his local garageman he has readily available a competent source of help in time of need. The farmer has not been accustomed to calling upon the garageman and does not think to do so on occasion. It is evident then that it is up to the garageman to let the farmers in his vicinity know that he is equipped to give tractor service and that it can be given quickly and skillfully. If he will do this he will attract a business which already is very much worth while and which will increase indefinitely as time goes on.

Charging by Time

Another mistake garagemen are alleged to have made when they have attempted to give tractor service is in using a tactless method of charging for such work which has run counter to what farmers are accustomed to and which has created friction and misunderstanding for that reason.

Farmers are unaccustomed to and do not understand service charges based upon time consumed in doing the job. They cannot understand why the charge should begin when the garageman leaves his place of business and continue until he returns. All the farmer can see is the actual time put in by the garageman while he is doing the job on the farm.

Now, if garagemen will make their charges a flat rate for the job, even though the price may be based upon so much per hour, the farmer will be much more favorably disposed to accept it as reasonable and right. If garagemen will in this respect make some little concession to farmer prejudices they will find it much to their advantage.

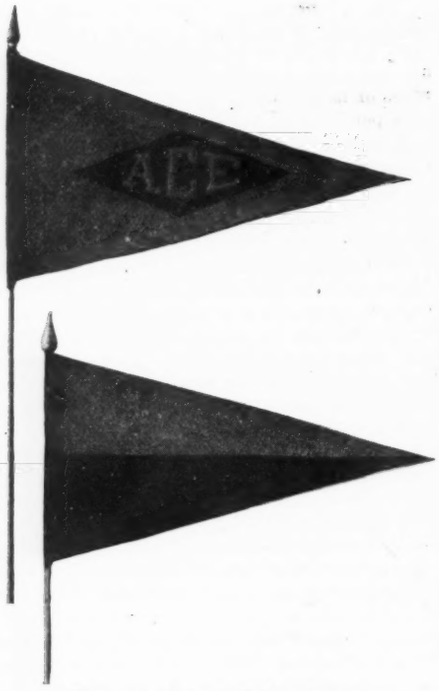
In practically every farming community from now on the matter of adequate tractor service will be of great importance and easily can be built into a regular business by the man who realizes the opportunity and who seizes it in the right way. Garagemen are equipped both materially and by experience to do this work and they can have a major portion of it if they will.

MAXWELL PRODUCTION DOWN

Detroit, Aug. 23—The Maxwell Motor Co., which has gone into war work on a large scale jointly with the Chalmers, has cut its production of passenger cars sharply. For the six months ended June 30 its output was about 50 per cent of the total of a year ago, or 22,000 cars, as against 43,500. Its truck production decreased from 12,000 to 4000.

The Fuel Economy Ace Has Arrived

Rivalry of 250 New York Bus Drivers for Title Brings Mileage for Week up from 6 to 6.75 m.p.g.—Winner Averages 8.1



The ace flag and the honor flag for the second best man

NEW YORK, Aug. 24—The fuel economy ace has arrived. He is a product of the Fifth Avenue Coach Co. of this city, the organization that operates 250 buses over Fifth avenue, Riverside drive, North Broadway and several of the other leading streets of this city.

The ace is the driver who runs his bus with the lowest fuel economy per mile for a given week. All the 250 drivers of these buses are eligible for the ace flag, which the winning driver is permitted to carry on his bus until a rival driver takes the coveted honor away from him.

The ace system was started July 15, when the 250 buses averaged 6 m.p.g. of fuel. In less than two weeks under the ace system the fuel average of these 250 buses was 6.75 m.p.g. This was the average, and many of the drivers were far above this figure.

The winning ace averaged 8.1 m.p.g. for his bus for the entire week. The next nearest averaged 8 m.p.g.

Week Saves 3334 Gal.

When the 250 buses were averaging 6 m.p.g. they were using 30,000 gal. of gasoline per week. This was cut to 26,666 gal. for the week when the average was raised to 6.75 m.p.g. This was an economy of 3334 gal, for the week. For a year this means an economy of 173,368 gal. on one system of buses and by one company.

But greater gains in fuel economy are under way and for a later week the winning ace averaged 9.8 m.p.g. and the next driver averaged 8.94 m.p.g. With the work just under way for a month the complete possibilities of gasoline saving by this ace system can scarcely be estimated.

The ace flag is a green triangular pennant in the center of which is a gold-colored diamond carrying the word "Ace" in green letters. This flag is carried on the top of the driver's cab.

The buses are all double-deck types using four-cylinder engines with 4 by 6-in. cylinders. Each bus loaded weighs 16,000 lb. and in the general work stops every $\frac{1}{10}$ mile to take on or drop off passengers. Nearly all the driving is on hard asphalt pavements and the buses run every day in the year.

The economy of fuel is accomplished in different ways, some of which are up to the driver and others up to the maintenance end of the Fifth Avenue Coach Co. The fuel conservation movement permeates every phase of the organization, there being an excellent esprit de corps throughout.

Drivers economize by coasting more than formerly, which is possible without any reduction in schedule. There are many hills on the New York streets and long grades where coasting is possible.

More sanity in stopping the buses has resulted in gasoline economy. Instead of rushing up to a street crossing controlled by a policeman and throwing on the brakes to stop in time, the driver now uses a little gray matter and coasts up to the crossing so that little braking is needed.

A good deal of economy has been accomplished by the co-operation between the driver and the repair or shop department. Every driver is now more careful to see that no brakes drag, as this is a fruitful cause of gasoline waste. The spark plug points are kept in much better condition. The compression in the four cylinders is watched more carefully. Carbureters have been much more finely adjusted, so that when a cold day comes there is more spitting than usual.

THE "ACE" FLAG on this bus signifies that the driver has established a high record for efficiency, particularly in economy of fuel (gasoline and oil) and in careful operation.

He has proved himself a special asset to the public.

The Fifth Avenue Coach Company

Here is the Fifth Avenue coach with the ace driver and the ace flag over the driver's cab. Above is the poster which explains the meaning of the flag

Not a single one of the changes made in this drive for fuel economy has called for the installation of a new part. No new carbureter has been fitted. The plan of the drive was to effect conservation by simple and quite practical means.

Under this economy system each bus has actually saved a little over 13 gal. of gasoline per week. If it were possible to effect such a conservation on all of our motor trucks in use, the figures of possibility are literally staggering. We have in use approximately 500,000 motor trucks and delivery wagons. Suppcsing each of these saves but 5 gal. per week instead of 13. A saving of 5 gal. per week would result in an annual economy of 130,000,000 gal. It is questionable if such economy could not be effected on all of them. Surely on all the 3-ton types and larger a greater economy can be effected and on the smaller ones an economy of 5 gal. a week seems a very easy matter.

If a similar possible economy were applied to all the passenger cars in use it is impossible to see just what results would follow. There are approximately 5,000,000 cars in use and if they saved but 2 gal. a week there would be an economy of 50,000,000 gal. a year or nearly 1,000,000 gal. a week.

100,000 Persons a Day

The Fifth Avenue Coach Co. carries 100,000 to 160,000 persons a day. The company always has stood for economical operation. Some winters ago when New York was not able to keep the snow off the streets the company built its own snow plows and cleans all the streets over which its buses operate. A little later it was necessary for it to develop sand-sprinkling wagons for use in spraying sand on slippery slopes. In every aspect of its activities economy has been the great objective. At the present time the company is building a new five-story garage. It is built on sloping ground so that the first three floors are reached by the buses without the use of an elevator. The entrance to the lower floor is at one end, to the second floor at the side and to the third floor at the second end. There is a small elevator service for the two top floors, which are used for body building and repairing, but all the buses can be housed on the three lower floors and not a cent is consumed for elevator service.

In addition to the ace flag the company has made use of an honor flag, which is for the second best man each week. The honor flag is a triangular pennant, half blue and half gold.

The company has gone a step further in the hope of educating the public to the work it is doing, and the bus with the ace flag on it carries a good-sized poster, as illustrated, explaining the meaning of the flag.

DRAWBAR TESTS OF MOLINE

Moline, Ill., Aug. 26—The results of the drawbar tests of the Moline Universal tractor made at the Salina tractor demonstration have been made public in accordance with the rulings of the test. In the drawbar, which was made on winter wheat stubble with the surface loose on top but firm underneath, the tractor worked with two 14-in. plows.

The results of drawbar are: When traveling at 2.18 m.p.h. the drawbar pull was 2150 lb. This gave a drawbar horsepower of 12.5. When traveling at 3.52 m.p.h. the drawbar pull was 2135 lb. The drawbar horsepower was 20.05.

SALINA TESTS MADE PUBLIC

Chicago, Aug. 26—Little by little the reports of the dynanometer and drawbar tests made at the Salina tractor demonstrations in August are being made public. Those manufacturers taking the tests were obliged to file a report with the association handling the demonstrations before the information could be made public.

The test of the Fordson in its 2-hr. economy plowing trials, made with a two-furrow No. 7 Oliver plow, showed that it plowed at a depth of 6 in. and in the 2 hr. plowed 1.9 acres of land. This is at an average of 0.94 acre per hour. Kerosene was used throughout and the consumption showed 2.24 gal. per acre used. In all 4.22 gal. were required for the 1.89 acres. The report shows that 4.88 gal. of water were used or 2.58 gal. per acre.

While engaged in this test the Fordson plowed at an average speed of 3.2 m.p.h. During the test 6 min. were consumed for stops and the net plowing time was 2 hr. 1 min.

The report of the Fordson in the drawbar test shows that when plowing winter wheat stubble with two 14-in. Oliver plows the results were:

Gear	Drawbar pull	M.P.H.	Drawbar H.P.
Low	1790	1.98	9.45
Second	1350	2.8	10.1
Second	1440	2.58	9.9

Believes in Looking Service in the Face

Branch Manager Thinks Truck Owner Should Know Maintenance Need from Start

ST. LOUIS, Mo., Aug. 23—Flanking the door of the General Motors Truck Co. warerooms in this city are two 40-ft. show windows. One of these serves as the window for the salesroom. The other is the front of the parts department, and in plain view is a parts rack extending entirely across the window, with the various parts showing in their foot-square pigeon holes.

"Is that parts rack on view a good thing, or is it likely to give the truck user the idea that G. M. C. trucks require too many renewed parts?" was asked of Branch Manager Charles E. Lightfoot.

"We have never quite settled that point," answered Mr. Lightfoot. "It does attract attention and when any criticism is raised, we easily can convince the inquirer that owing to the very large territory that we serve our display of parts is certainly conservative.

"But it is well to look the maintenance question in the face and not try to dodge it, for when the truck owner learns that there is a maintenance question, he will resent not having known of it before.

"As to service for trucks, it need not be a serious question to any well-educated motor car dealer. But he must not make the mistake of slopping over. In making connections with motor car dealers we get their ideas on this question and we take only dealers who conform to the G. M. C. idea.

"If a dealer in selling motor cars has learned just what his factory guarantee means and stands on that within reason, he can do the same with trucks. There is no reason why a truck hit by a street car should be repaired free. That is not the province of free service.

"The one big question in truck service is a readiness to serve. When a passenger car is laid up in the shop, the owner usually is saving money. When a truck goes to the shop, the owner is losing money. Perhaps his entire business is stopped. The service station should be ready to keep trucks on the road at all times, even at some expense. Service is what the buyer expected.

"In our service station we will not accept any trucks for repairs except our own. We have time for other repairs and probably could make some money on the work. But the question that appeals to me is this, if a G. M. C. owner drives up here for repairs and sees another make of truck ahead of him, he is likely to say: 'You care more for a few dollars than keeping your own trucks in service.' If he sees a G. M. C. ahead of him, he is not likely to complain.

"An important point in maintenance is to stir the pride of the drivers. We know of scores of drivers here who think as much of their trucks as any driver ever did of his horse.

"I often am forced to smile at their enthusiasm and their belief in their trucks. They will challenge drivers of other trucks of equal capacity to hitch the rear ends of the trucks together and see who can be pulled out.

Loyalty Pays

"Of course, too much of such experimentation might be disastrous, but the man who is as loyal as that to his truck is going to watch that truck to see that it is kept in good condition. His watchful eye and ear is half of the battle.

"Education of drivers in the use and possibilities of trucks, the proper loading and the likely ills—by that I mean the points to watch for possible slight breaks that may become serious—is a big part of the maintenance of the truck.

"A service department should be efficient as to work done, as to methods, overhead cost and in every way business-like except as to the skimping of help likely to be needed. But it should not be permitted to become a heavy drain on the resources of the selling end. Neither should it be considered a source of great profit. Be reasonable in service in every way except turning out good work. Then only the possibility for good should be considered."

A short-haul motor truck caravan on the road to market

Short-Haul Motors Relieve Congestion

Motor Trucks in Inter-City Business Increase 400 Per Cent on Coast

THE motor vehicle and other business men of Southern California are probably doing as much as any other section of the country toward relieving the congestion in transportation by their method of using the motor truck and tractor almost exclusively for short-haul work. By short-haul work is meant hauls of 200 miles and under—inter-city freight transportation. In California it has been conclusively demonstrated that it is cheaper in dollars and cents to short-haul goods by motor vehicle than by rail.

At this time every freight car, every locomotive and every railroad employee on the continent is needed in the crisis through which this country is now passing, to take care of the long-haul work—the transportation of munitions, ordnance, soldiers and freight in general between distant points. In taking care of the short-haul business the motor vehicle is not only showing the business man but it is doing a real and valuable service to the Government, for it releases hundreds and even thousands of cars which formerly were used for this short-haul work so that they may be used for long-haul transportation. The box car has no substitute for long-haul work, and by releasing it from short-haul duties the motor wagon is doing its bit toward licking the Kaiser.

Increased Rapidly

The use of the motor truck in city-to-city transportation in Southern California has increased at least 400 per cent since the country entered the war. Thousands of motor trucks are constantly on the highways, while it is almost an everyday experience to see a tractor coming pounding up the road followed by a string of trailers numbering from three to a dozen. Regular motor car freight routes have been established from Los Angeles to San Diego, 125 miles, this distance being covered daily by these trucks. From Los Angeles to the various beaches, ranging from 15 to 50 miles, on one side, and from the city to the inland towns and cities on the other, these distances ranging from 10 to 100 miles, is a veritable network of motor vehicle transportation lines.

The success of these motor freight lines may be attributed to three things—the superior quality of the average motor truck of to-day, the excellent system of good roads of Southern California and climate.

90-MILE FREIGHT TRUCK ROUTE

Milwaukee, Wis., Aug. 26—The first regular freight service by motor truck to be established between Milwaukee and Chicago was opened during the last week by the Motor Transportation Co. of Milwaukee, organized with a capital stock of $100,000 by Milwaukee capital and Charles C. Newburn of Chicago. Four trucks, each of 3-ton capacity, are being operated over the 90-mile route. Besides the terminal offices in Milwaukee and Chicago, the company will maintain stations at South Milwaukee, Racine, Kenosha and Waukegan for the handling of freight. The Milwaukee interests in the new company are represented by Charles A. Robinson and George D. Persons, formerly passenger engineers on the Milwaukee road. During the first few days of the operation of the new service, no difficulty has been encountered in getting capacity loads, going and returning. In fact, much more freight has been offered than can be carried with the present equipment of four trucks and the promoters expected to add as many more within a short time.

COAST DEALERS AUTOMOTIVE

Los Angeles, Aug. 23—Despairing of the probability that they will get sufficient stock after the first of the year to maintain their organizations and keep their establishments going, the exclusive passenger car dealers of this city at last have begun to awaken to the possibilities as automotive dealers. Nearly all are now in the market for a good truck or tractor line that will tend to tide them over during the remainder of the war period, and it is doubtless that once having entered this field they never again will return to the old passenger car only way of conducting their businesses.

Hawley, King & Co. have acquired the Pacific coast distribution of United States trucks and are offering their sub-dealers, acquired as distributers for Oakland cars, first chance at the truck line. This firm began business in 1887 as farm implement dealers. When the motor car showed possibilities they took on a line and in recent years have devoted all energies exclusive to this branch, closing out the farm implements entirely.

Several other leading passenger car distributers have visited the eastern factories recently, and the result is they now are planning to take on trucks and tractors.

About six months ago a canvass was made of the prominent passenger car dealers to ascertain their attitude toward trucks and tractors and not one looked with favor upon such a department. All maintained that the farm implement dealer was the one best qualified to handle tractors and an exclusive truck dealer was necessary for that field. They now realize they are big enough to have irons in more than one fire at the same time, so those who desire to keep their doors open hereafter have become convinced they are not too old to learn.

TO REGULATE GAS PRICES

Washington, Aug. 23—Prices of gasoline and other oil products will be stabilized and steady production of petroleum will be assured by a plan now being worked out by the National Petroleum War Service Committee in co-operation with the United States Fuel Administration. Maximum premiums will be arranged for payments for various qualities of oil. Heretofore competition has caused various refiners to bid against each other and pay excessive premiums over the base rate for oil. This has resulted in exorbitant consumer's prices and also has created disturbance in the oil industry, frequently hampering oil production.

By the maximum premiums it is expected that permanent prices for crude petroleum will prevail and that its proper production and distribution will be assured. Protection will thus be given to both small and large refineries in securing their supplies while at the same time consumers will be insured against excessive prices for gasoline and other oil products.

REPAIR RECORD IS KEPT

Wichita, Kan., Aug. 24—The Wichita Automobile Co. is on a strictly cash basis. This means not only that none of the money due gets away from the company but that no work or supplies fail to get a charge. The company has adopted a form of repair record, on which every order, no matter how small, is entered—and the customer signs it. The signature goes down under the following explicit statement on the card:

"You are hereby authorized to make the above repairs on my car for which I agree to pay on delivery."

Besides the instructions of the owner to the company, the card bears the record of the workman's time and of supplies used, and instructions to the mechanics. The card is kept by the company.

This is one of the California short-haul outfits, such as is described on the facing page

There are occasions when the customer does not have the money with him to pay the bill; or when a delivery of a car is made, accompanied by bill. To meet this contingency the company provides a due bill. This consists of a card with stub. The card bears an acknowledgment of the amount due the company and the statement that if not paid in three days the bill will draw interest at 8 per cent. The customer signs the card, retaining the stub. The customer attaches to his check to the company a perforated stub bearing the same number as the card. The company attaches the required revenue stamp of 2 cents to each card, which makes its impression on the customer.

20¼ TONS OF AIR MAIL

Washington, Aug. 23—From May 15, when the air mail service was inaugurated, to Aug. 12, when the military authorities turned over the service to the Postoffice Department, a total of 20¼ tons of mail was dispatched between New York and Washington. This included 270 flights covering 421½ hr. of flying, with a total of only sixteen forced landings in all.

Six Army officers who operated the airplanes daily between Washington and New York are commended by Postmaster General Burleson, who says:

"Lieut. J. C. Edgerton made fifty-two trips on the mail route with but a single forced landing, due to an accident to a magneto in his plane. His total flying hours were 106 hr. 36 min., and his total mileage was 7155 miles.

"Lieut. E. W. Killgore made thirty-nine trips on the mail route with five forced landings; 85 hr and 50 min. total flying time, with a total mileage of 5670 miles.

"Lieut. Walter Miller made forty-eight trips on the mail route with four forced landings; 85 hr. and 50 min. total flying with a total mileage of 4975 miles.

Thirty-eight Trips

"Lieut. Stephen Bonsal made thirty-eight trips on the mail route with four forced landings, 74 hr. 33 min. total flying time, with a total mileage of 4875 miles.

"Lieut. T. H. Webb made forty-one trips on the mail route with but one forced landing; 44 hr. 49 min. total flying time, with a total mileage of 3680 miles.

"Lieut. H. P. Culver made thirty-six trips on the mail route with but one forced landing; 47 hr. 52 min. total flying time, with a total mileage of 3045 miles."

To Promote Highway and Motor Trucks

Colorado Will Work Throughout State on Educational Campaign for Roads

DENVER, Col., Aug. 23—Plans for extensive development of Colorado highways, promotion and regulation of motor truck transportation and a general advancement of the motor car industry in this territory were made at a Denver meeting of the executive committee of the Colorado Good Roads Association and the legislative committee of the Colorado Association of County Commissioners. The four main steps to be urged by a statewide campaign are:

1—An enabling act to give the people of the state an opportunity to vote on a bond issue for building and maintaining permanent highways throughout Colorado.

2—A transferring from the general fund to the state highway fund of all receipts from the state inheritance tax, now amounting to about $150,000 yearly.

3—A doubling of the yearly motor car license fees, which are now far below those in effect in many states.

4—State traffic regulations aimed to give control over the speed of motor trucks, width of tires and other factors vitally affecting the wear of highways.

Yearly License Fee

The yearly license fee paid by car owners in Colorado is $2.50 for cars up to 20 hp., $5 for above 20 and up to 40 hp., and $10 for more than 40 hp., all based upon manufacturers' rating. These fees are divided equally between the state highway fund and the road funds of the respective counties, the licenses outside of Denver being issued by the county clerks upon authority of the secretary of state. Good roads workers claim that motorists ought to be willing to pay twice these fees, as they would benefit from improved road conditions thus made possible.

The plan of the two organizations backing these enterprises to provide ample funds to develop Colorado's system of highways on a large and permanent scale is to conduct a state-wide campaign of education and lead the people to demand that the next session of the legislature shall enact these measures. Substantial co-operation is counted upon from the Colorado State Automobile Association, Denver Motor Club, Rocky Mountain Auto Trades Association and other motoring, trades, good roads and commercial bodies throughout the state.

The importance of motor express routes will be urged as one strong argument for the legislation recommended. Colorado now has about 42,000 miles of state and county highways definitely aligned, with a good percentage well surfaced, but increased motor travel demands wider and more solid roads in many localities.

CITY MAY TAX TRUCKS

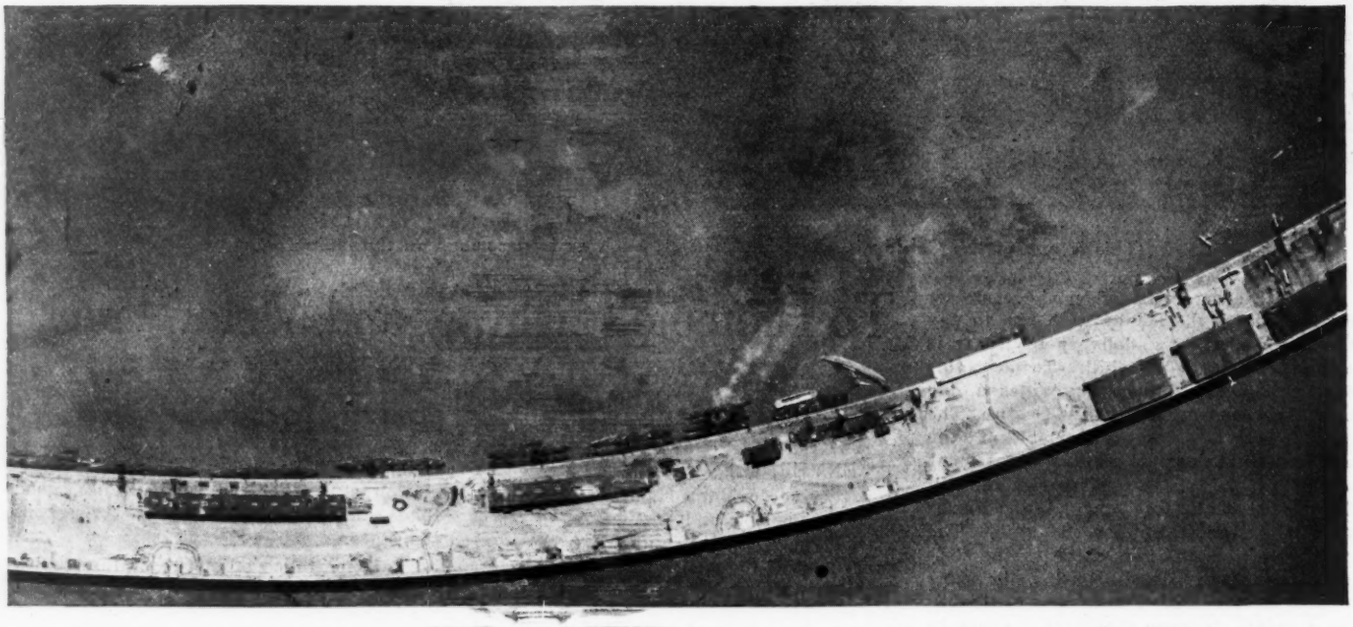
Los Angeles, Aug. 23—An ordinance providing for a special license tax on all commercial vehicles has been passed by the city council but has not been signed by the mayor. If the mayor signs it, the motor car dealers and truck owners will bring a referendum before the voters to have the ordinance set aside and probably undertake a recall directed against those councilmen who voted for the bill. The opposition is very strong and will have plenty of support. The commercial vehicle tax is designed to help raise $400,000 annually lost to the city's revenues by voting out the saloons. It applies to every sort of motor vehicle used for any kind of delivery and stipulates a fee from $6 to $80 annually, depending upon the capacity of the motor vehicle.

COLUMBUS ADDS POSTAL TRUCKS

Columbus, Ohio, Aug. 24—The Columbus postoffice department has inaugurated an extension of the parcels post routes out of Columbus by motor transportation. A line has been established between Cincinnati and Columbus in which daily service is given in both directions. The schedule provides for the use of two trucks which will each make a one-way trip daily, except Sunday. The schedule provides for the truck to leave Columbus at 6 a. m. and arrive at Cincinnati at 5:10 p. m. Trucks will leave Cincinnati at 5:50 a. m. and arrive at Columbus at 7:35. Drivers are to be changed at Hillsboro, so the driver will spend every night at his home.

Bottling Up the U-Boats

As Viewed from the Air

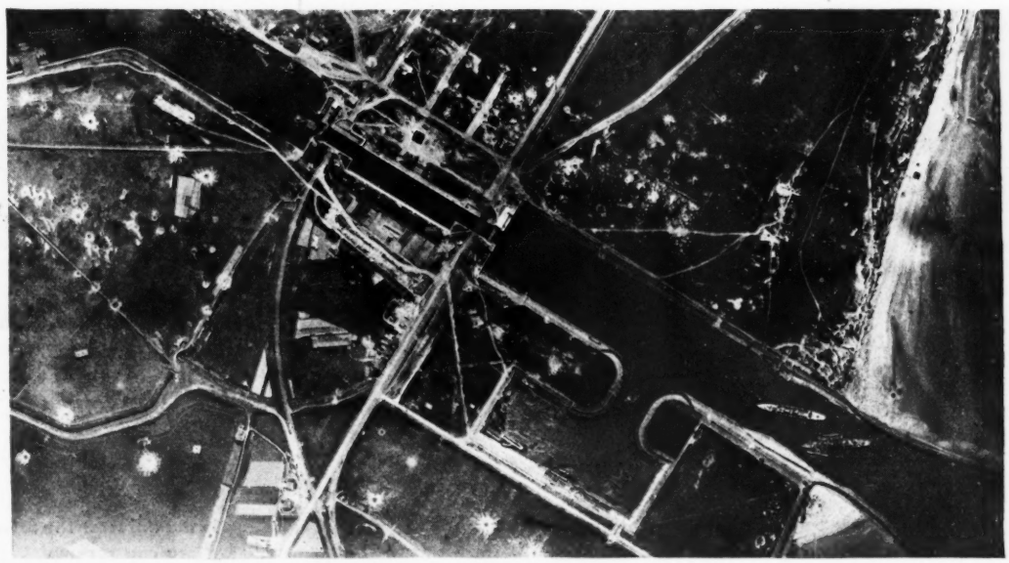


Zeebrugge mole on the Belgian coast. This is a stronghold of the Hun. It is a base for seaplanes, submarines and destroyers. The photograph taken by the pilot in a Handley-Page machine shows the result of his work. Lying in the water may be seen a destroyer on its side, sunk by a bomb from the airplane. The photograph also shows a series of German destroyers in the water at the edge of the dock, four seaplane sheds with seaplanes in the air over the water, and over the land. The long buildings are factories used for repairing submarines and boats. Other German ships may be seen out at sea

Six bomb hits on the railroads at Carlsruhe made by British aviators. Four of these hits were made by one machine which easily can be noted by the direct line in which the hits fell, the dropping of the bombs and the trail of the plane

The city of Cologne while being bombed by a Handley-Page airplane. The smoke denotes the explosion of the bombs. The heaviest smoke marks the bomb exploded when the photograph was snapped. Over near the center of the photograph and toward the railroad line may be seen a bomb falling

The city of Metz attacked by airplanes. Direct hits made on the Metz railroad stations and railroad line. In this photograph the clouds must not be confused with the smoke of the airplane bombs. The airplane bombs exploded directly on the railroads and near them, and are shown by the small light smoke puffs outlined



Zeebrugge harbor, a submarine base. This picture, taken at low tide shows clearly the two British ships sunk by British naval officers across the channel and blocking the channel so that German submarines could not get out into the sea. A German dredge may be noticed working along side of one of the sunken vessels

Maintenance of Rear Axles

No. I—Russell Equipment and Adjustments

Drive Gear Adjustment, Bearing Sizes, Etc., of the Russell Rear Axle, Types P and O, S, U and T

THE adjustment of bevel drive gear and pinion on types P and O is obtained by the use of threaded adjusters, locked in place after the proper mesh has been formed. The proper method is as follows:

1—Back off nuts from clamp bolts on extreme end of drive pinion carrier near universal joint flange.

2—Remove bolts and lock which is in slot in center of carrier.

3—Remove differential adjuster lock on top left side of housings.

4—To adjust gears use a large wrench on end of drive pinion adjuster and a large screwdriver or piece of steel bar inserted in prongs on the ends of the differential adjuster through openings in the housing. Turning either to the left forces the gears apart or tends to throw them out of mesh, giving greater lash. Turning either to the right runs them in and decreases the backlash.

5—When proper adjustment has been obtained replace the adjuster locks and clamp the bolts of the drive pinion carrier.

The adjustment of the bevel drive pinion is obtained by the use of a threaded adjuster and that of the bevel drive gear by shims placed on the outside of differential thrust bearing. The adjustment method on types S, U and T is as follows:

S, U and T

1—Remove the drive pinion adjuster lock on top of the drive pinion carrier by removing the two cap screws which hold it in place.

2—Back the nuts off from the clamp bolts on the extreme end of the drive pinion carrier near the universal joint flange.

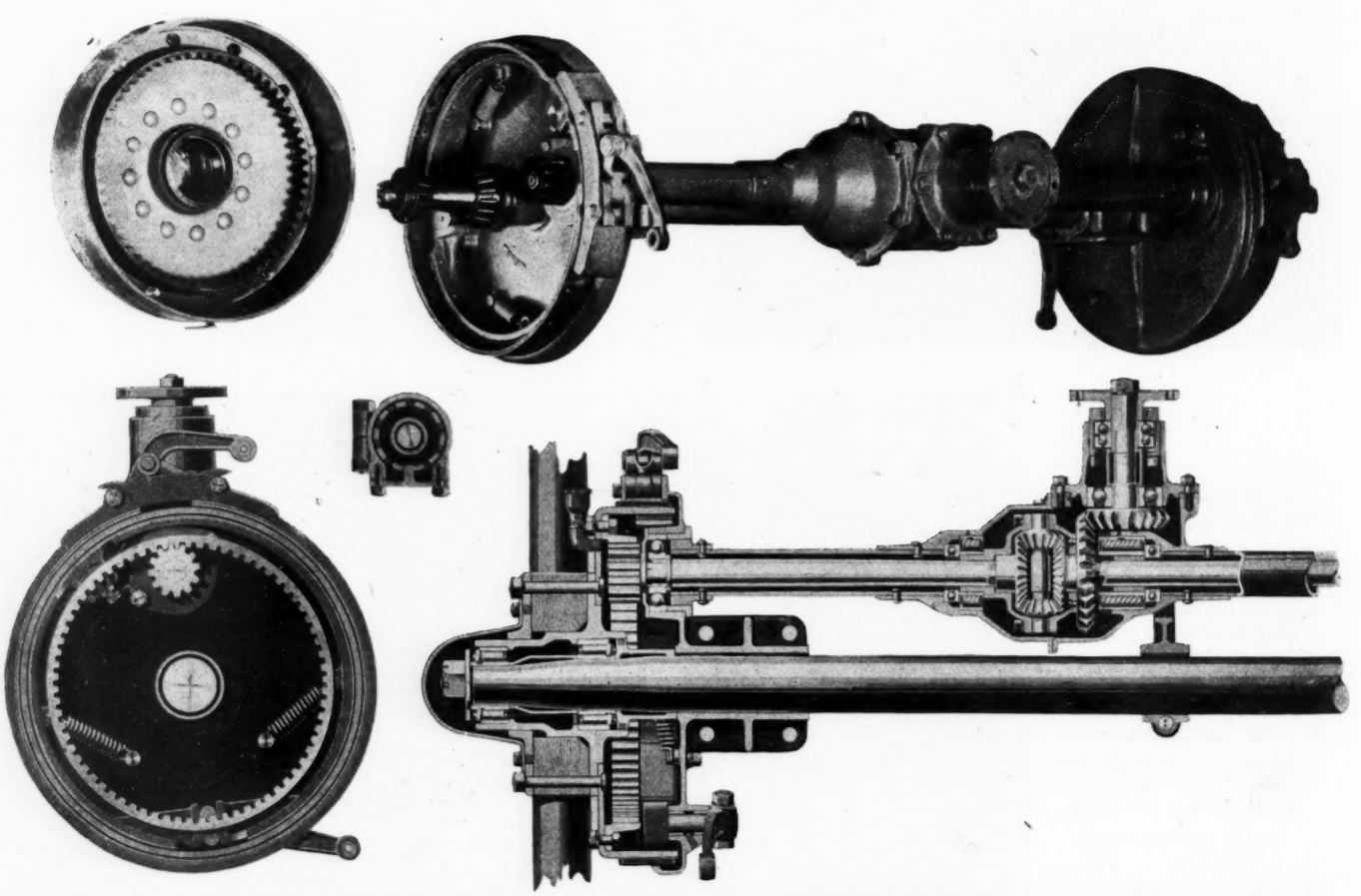
3—Use a large wrench on the end of the drive pinion adjuster. By turning to the left the pinion is backed away from the drive gear, tending to give greater lash. Turning to the right runs the pinion in farther, decreasing the backlash.

4—If it is found necessary to adjust the bevel drive gear, the housing must be dissembled and shims of a thickness determined by the best position of the gear must be placed behind the thrust bearing on either end of the differential.

5—When the proper adjustment has been obtained bolt the housing securely together and assemble the parts in the order of dissembling.

Following is a list of concerns who use the Russell rear axle, together with the type of axle employed by each:

	Type Axle
American Commercial Car Co., Detroit	P, O, S
Bethlehem Motors Corp., Allentown, Pa.	P, S, T
Columbia Motor Truck & Trailer Co., Pontiac, Mich	U
Denby Motor Truck Co., Detroit	P, S, U
Fulton Motor Truck Co., Farmingdale, L. I., N. Y.	O
Independent Motor Truck Co., Davenport, Iowa	O, S
Briscoe Motor Corp., Jackson, Mich	O
Selden Motor Vehicle Co., Rochester, N.Y.	O, S, T
Traffic Motor Truck Corp., St. Louis, Mo.	O
Union Motor Truck Co., Bay City, Mich.	T
All-Car Unit Co., Philadelphia, Pa	P, O, S
Allied Truck Co., Toronto, Ont	O
Commercial Car Unit Co., Philadelphia, Pa.	P, S, U
Guaranty Motors Co., Cambridge, Mass.	P, O, U
Iowa Motor Truck Co., Ottumwa, Iowa	P, S
Hebb Motors Co., Lincoln, Neb	O



Russell rear axle, showing location of bearings. The small illustration is the adjuster for drive gear and pinion, the block for which is shown at the bottom, held by two cap screws

All bearings on the Russell axles are held in place by suitable retainers which must be removed before the bearings can be replaced. When the retainers are dissembled it is only necessary to tap lightly around the bearing races to remove them.

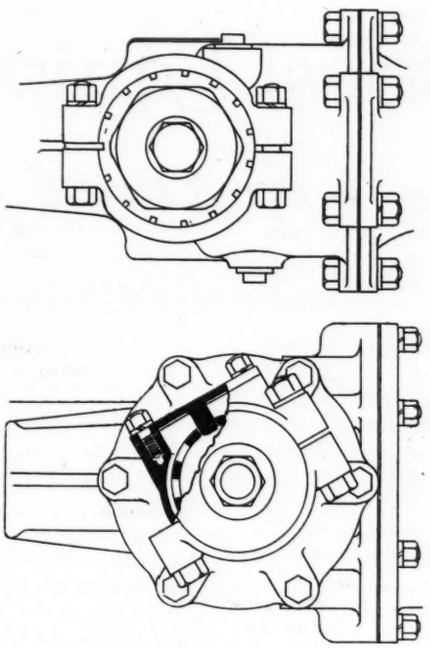
The new bearings must be pressed in place, after which all retainers must be assembled.

TRIES WOMEN IN REPAIRS

Cincinnati, Ohio, Aug. 24—Harry Single, who runs a large repair and maintenance motor car garage in this city, finding himself unable to maintain the necessary number of men to conduct his business, tried the experiment of using women. He filled his two vacancies from the Y. M. C. A. school, where efficient training had been given, and the women put to work proved so satisfactory that he has been adding others. They grind valves, take up brakes, change engines and, in fact, do all the mechanical work that a man does. Mr. Single likes their work so well that he is going to keep on substituting them for men, as he thinks they are more conscientious and competent than the men he can get under present conditions.

TRACTOR CHANGES THRESHING

Bloomington, Ill., Aug. 24—Threshing is no longer the occasion for the assemblage of men and teams from the entire township and all the women of the neighborhood getting together to prepare meals for the band of workers. This fact was demonstrated this week on the farm of Edward Francis in New Lenox township. Mr. Francis, with his regular force of help, threshed the wheat from 400 acres of land, using his own thresher which was operated by a tractor.



Drive gear and pinion adjusters on Russel axles, showing location on pinion carrier

In days gone by the same job would have required from twenty to thirty men and ten to twelve teams. This summer the harvesting was successfully put over by four men and two boys and three teams. Each day 500 bu. of wheat were delivered to the elevator. In former years each farmer has co-operated with his neighbors to complete the threshing, and this delayed the operation for several weeks. With individual ownership of a threshing outfit, each farmer is able to take care of his own crop, the moment conditions are favorable and, at the same time, is independent of his neighbors.

The tractor utilized by Mr. Francis was purchased a year ago. He asserts that it already has paid for itself and will continue to do so. All the work in connection with the planting of the 400 acres of grain was performed by himself aided by one man. In the operation of the threshing, two teams were required to haul the bundles from the shocks in the field to the machine, the loading being done by the drivers. One team hauls eight loads of grain to the elevator daily. When there was a lull in the threshing, Mr. Francis put the tractor to work, plowing for the next crop.

Mr. Francis is now figuring upon the cost of trucks for hauling his products to market and may supplant his horses with the motor vehicles next year. His success with a tractor has attracted the attention of neighboring farmers and it is expected that sales will be numerous in the county during the coming year.

TRUCKS ON BUSINESS BASIS

Boston, Mass., Aug. 24—One of the results of war conservation is the attitude being adopted by some of the truck dealers in discontinuing free demonstrations these days. In the past a clever man with a rush order on his hands and unable to move it with horse-drawn vehicles would send a suggestion in a roundabout way to truck dealers that he was in the market for a truck. Salesmen would call on the prospect. He wanted to be shown. So he would tell about some loads he was hauling, and for the next few days trucks would be competing against each other giving the man free service.

A. H. Sowers, who handles the Fulton, got up against it, and now he has stopped it in his organization, and he is trying to get the dealers' association to back him up to put an end to it.

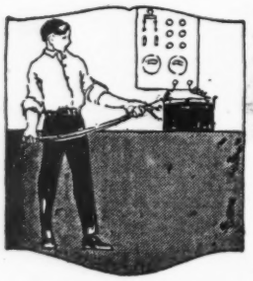
When anyone requests a demonstration of a Fulton now Mr. Sowers agrees to it provided the man puts up a check for $25. Then he sends the truck out to do a day's work. If the man buys the truck the $25 is allowed on the account. If he does not, the $25 is retained for the work the truck performed. In the several instances which Mr. Sowers has figured with this plan not one of the business men to whom he put up the argument that in these war days it was not fair to expect to get something for nothing has one man made any objection. Also, he has been selling the trucks.

CINCINNATI ORGANIZES ITS TRADE

Cincinnati, Ohio, Aug. 24—The Cincinnati Automobile Trades Association has been organized in this city with H. H. Brenuner president, S. A. Wright vice-president, R. R. Curl secretary and R. R. Wooley treasurer. The organization includes practically everybody interested in any way in the automotive trade. There were 130 members to start, which will be increased to 300 by Sept. 1. The purpose of the organization is to procure united co-operation for war purposes, cut off extra hours, provide an emergency night and Sunday service and act as a unit in any proper and necessary matter.

Bearing Sizes in Russell Rear Axles

Name of Bearing	Type	Size
TYPE P		
1—Drive Pinion Bearing—Outer	Ball—DR	306
2—Drive Pinion Bearing—Inner	Ball—SR	1406
3—Jackshaft Pinion Bearing	Ball—SR	1406
4—Differential Bearing—Right	Roller	
5—Differential Bearing—Left	Ball—DR	208
6—Wheel Hub—Outer	Roller	307-N
7—Wheel Hub—Inner	Roller	309-N
TYPE O		
1—Drive Pinion Bearing—Outer	Ball—DR	306
2—Drive Pinion Bearing—Inner	Ball—SR	1406
3—Jackshaft Pinion Bearing	Ball—SR	1406
4—Differential Bearing—Right	Roller	
5—Differential Bearing—Left	Ball—DR	208
6—Wheel Hub—Outer	Roller	307-N
7—Wheel Hub—Inner	Roller	309-N
TYPE S		
1—Drive Pinion Bearing—Outer	Ball—DR	307
2—Drive Pinion Bearing—Inner	Ball—SR	1407
3—Jackshaft Pinion Bearing	Ball—SR	1407
4—Differential Bearing—Right	Roller	
5—Differential Bearing—Left	Roller	
6—Wheel Hub—Outer	Roller	3554-T
7—Wheel Hub—Inner	Roller	4553-T
8—Differential Thrust Bearing	Ball Collar Type	
TYPES U & T		
1—Drive Pinion Bearing—Outer	Ball—DR	307
2—Drive Pinion Bearing—Inner	Ball—SR	1407
3—Jackshaft Pinion Bearing	Ball—SR	1407
4—Differential Bearing—Right	Roller	
5—Differential Bearing—Left	Roller	
6—Wheel Hub—Outer	Roller	3554-T
7—Wheel Hub—Inner	Roller	4553-T
8—Differential Thrust Bearing	Ball Collar Type	



Electrical Equipment of the Motor Car

By David Penn Moreton & Darwin S. Hatch.

Editor's Note—Herewith is presented the 109th installment of a weekly series of articles begun in MOTOR AGE, *issue of June 29, 1916, designed to give the motorist the knowledge necessary to enable him to care for and repair any and all of the electrical features of his car, no matter what make or model it may be. At the conclusion of this series, "Electrical Equipment of the Motor Car," with additions, will be published in book form by the U. P. C. Book Co., Inc., New York.*

A thorough explanation of the fundamentals of electric circuits preceeded descriptions of the general types of starting, lighting and ignition apparatus, signalling devices, magnetic transmissions, etc. This is being followed by the installation, care and repair of individual systems, beginning with the special equipment for Fords.

Part CIX—Vibrator-Les Ignition for Fords

AN ignition system eliminating the vibrating type of coil and conventional timer is made by the New York Coil Co., New York. One of its many advantages is that a rapid and positive interruption of the primary current is obtained without sacrificing the possibility of thoroughly saturating the primary windings of the coil. The coil is of the non-vibrating type, is specially wound to obtain thorough saturation of the primary circuit and eliminates the regular Ford dash unit, which is replaced by a neat panel containing a two-point switch. The new coil is supported by a special bracket which is attached or bolted to the studs of the intake manifold.

Interruption Is Positive

The device producing the break or interruption of the primary circuit, which is mounted on an elevating gear bracket, is shown in Fig. 589. It is a simple apparatus, one that is practically foolproof, and a construction that requires no attention other than an occasional adjustment of the contact points. The operation of the breaker is novel, as it combines magnetic and mechanical action, one checking the other, and the possibility of the points fusing or sticking is eliminated. This is an advantage, particularly when the engine is started by manual cranking.

How Breaker Is Made

The breaker includes an armature, D, carrying a contact point, H, Fig. 589. Directly under the armature is a magnet, E, connected in series with the primary winding of the non-vibrating coil. The member C is supported at one end by a stiff spring arranged normally to exert a downward pressure to keep the contact points separated. The part C also engages a hooked section of the armature, further assuring normal separation of the contact points.

Breaking the Circuit

The closing of the circuit, or engagement of the contact points, is obtained when one of the four steel pins of the rotating member B contacts with the member C. This raises the member C and allows the armature D with its point to contact with the fixed point L, which is in the form of a screw. This screw is carried in a support, and the former is slotted so that it is a simple matter to make any required adjustments.

The circuit is completed through the magnet E when the contact points meet, and the magnet is so energized and the circuit so rapidly established and broken that a shower of sparks is obtained from the secondary of the coil. This action continues during the time the pin makes mechanical contact with the member C. After the pin separates the armature assumes the position shown in the illustration, thus breaking the primary circuit and preventing fusing or sticking of the points as previously explained.

The Vibrator-Les system comes complete with all wires, cables with terminals, also a tube for supporting the high-tension leads.

Installing the System

The timer on the engine is removed and by taking off the nut and prying off the small collar, a pin will be found which should be pushed or driven out and then by means of a screwdriver the part carrying the roller and the spring of the old timer can be pried off the shaft. The loose gear accompanying the new bracket is slipped on the shaft, the same pin and collar being used to fasten the gear to the shaft. The nut should be tightened securely.

The bolt located directly under the oil filler, which holds the end plate to the crankcase, is removed, as is likewise the bolt on

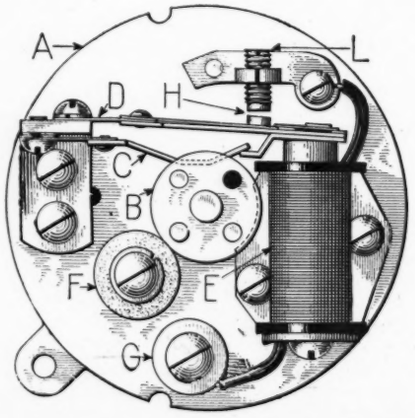


Fig. 589—Top view showing how Vibrator-Les coil of New York Coil Co. operates

the opposite side. The bracket then is placed in position, having first loosened the upper bolt that tightens the fan belt. See that the bracket fits inside the central turned out surface of the end plate and by two longer bolts furnished with the outfit secure the bracket in position. Care must be exercised to see that the brackets fit properly in the turned out section. Due to some variation present in the end plates it may be necessary in some cases to fit a washer between the lugs of the bracket arms and the end plate.

Extreme care must be exercised to draw up evenly on the bolts and see that the bracket fits readily into position. If the bracket will not go easily into position, the lugs are likely to be broken off by careless handling. The bracket should be filled with soft grease.

Timing the Instrument

Disconnect the spark plug cables and remove spark plug No. 1. By No. 1 is meant the plug next to the radiator. Lay it on the engine with the cable connected to the coil and have the spark lever on the steering post all the way forward or in the retarded position. Turn the engine carefully until a spark takes place at No. 1 plug. Be very careful to stop the engine the instant the coil begins to vibrate. This method is a simple way of ascertaining the proper firing position for those not skilled in timing the engine.

A much more positive procedure is to have an assistant turn the engine until both valves are closed, then by looking into the spark plug hole the next half turn of the crankshaft will bring the piston to the extreme upward travel of its stroke. It is in this position that the spark should take place in No. 1 cylinder, which may be accomplished by turning the shaft of the distributer in a counter clockwise direction by the two set screws, until a spark will jump ¼ in. from the end of No. 1 terminal to the metal part of the engine. Of course, it is understood that the new advance rod has replaced your old one, that the spark advance lever under the steering wheel is in the extreme forward position and that the wiring is all connected. A battery should be used as a source of current in making these tests. Care should be taken to tighten the set screws in this position, which completes the setting of the instrument.

Wiring the System

The wiring is to be exactly as shown in Fig. 590. Of course, it is understood that the regular Ford coil box is removed and the panel supplied containing the switch has been secured in its place. The long wire attached to the switch is run through a hole registering in the dash and carried completely through the metal tube, down to the coil and connected to the coil post marked S. The magneto cable is connected to the very short wire which is run through the opposite hole on the dash, connection being made by putting the looped end of the wire under the screw head and nut on the magneto terminal. One primary wire from the bottom of the distributer terminal on which is stamped I must be connected to the center post on the coil marked I. The other primary wire from the bottom of the distributer has the terminal marked C and must be connected to the post C on the coil. The third wire coming from the bottom of the distributer has its terminal marked G. This is clamped under the coil bracket between the bracket and the manifold to insure a good ground connection. The secondary wire from the center of the distributer is connected to the post on the left side of the coil.

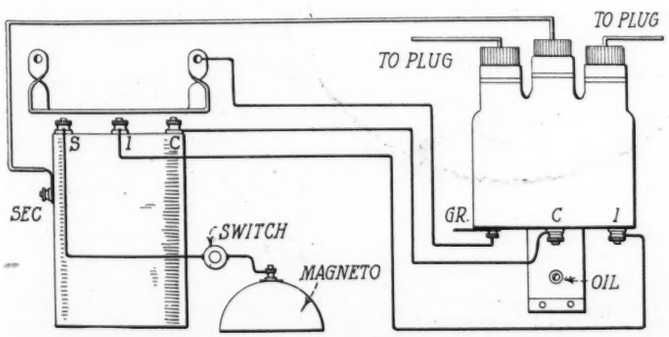


Fig. 590—Wiring diagram of Vibrator-Les ignition system for Fords

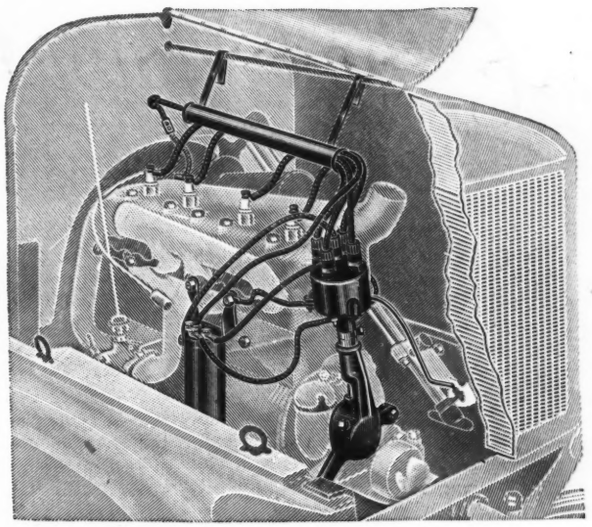


Fig. 591—Complete installation of New York Coil Co.'s Vibrator-Les ignition system on a Ford

The plug terminals are brought out through the metal carrying tube in the proper order and are connected in direct rotation to the plugs as marked, which is 1—2—4—3. Proper firing order will result, as the plugs are connected to the distributer in such a manner that the spark will occur in the various cylinders in the order of 1—2—4—3, which is correct for the Ford engine. Do not become confused on this point.

The coil is secured by removing the nuts from the two studs holding the manifold to the engine, nearest the radiator. The coil brackets are slipped over the studs and the nuts are replaced, with the ground wire under the forward clamp. The switch is on when the bottom of the key points toward No. 1 point on the switch.

If it should ever be desired to use dry cells or storage battery in connection with the magneto, a wire direct from the battery is carried through the dash and by removing the switch cover connection may be made under the screw head to the bottom lug on the right side of the switch. The other side of the battery is connected to the frame of car. The complete installation is shown in Fig. 591.

Adjustments

The instruments are adjusted carefully before leaving the factory, and it should never be necessary to change the tension of the vibrator spring unless a new vibrator is necessary. All adjustments should be made by the single adjusting screw and should be such that when engine is turned so that one of the pins raises the curved member to its full limit there should be a space between the contact points the thickness of two sheets of writing paper when the armature is held against the magnet by the finger.

It is of great importance that the tension on the armature spring is neither too weak nor too stiff. This tension may be regulated by loosening both the screws holding the bracket to the base that supports the armature. However, this should never be attempted unless the spring's tension is too great to allow the armature to vibrate at low speed or too weak to give a sufficiently powerful spark.

Several drops of oil should be injected into the oil cup twice a week. However, do not over-oil, as any oil on the contact points will cause missing.

The Motor Car Repair Shop

Timing an Engine After Reassembling

THE mechanic who has not had sufficient experience with engines is apt to get them timed wrong when reassembling after an overhauling. If there are marks on the gear teeth, this is fortunately not a difficult operation. But if there are no marks and the engine is down, the job is not so simple. The general method for a four-cylinder engine, let us say, is to get No. 1 piston, the one nearest the radiator, on top center, place the valves in correct relation to it and finally the magneto breaker points position in conjunction with the distributer arm.

Four-Cylinder Engine

The illustration is that of a four-cylinder engine having high-tension magneto for ignition. The arrows show the direction of travel of the various gears and crankshaft, also camshaft. Both valves are closed, though only one can be shown, the intake. Note that the cam has turned so that the valve is closed completely with a slight space between the end of the valve stem and tappet.

Let us assume the engine assembled with the exception of the timing gears and magneto drive, the latter either chain or gear drive. The steps in timing valves and ignition are then as follows:

1—Place No. 1 piston on top dead center. With the head off this can be done easily, otherwise the piston can be brought to the top by aid of a wire inserted through the spark plug hole or valve cap openings.

2—With piston in this position make a prick punch mark on top of flywheel and one on crankcase coincident with it. This is to facilitate timing after the engine is taken down later on. Put 1 and 4 on this mark, which means pistons 1 and 4 are on top.

3—Rotate camshaft in normal direction and watch the movement of the valves in No. 1 cylinder. There will be a time when both valves are closed and farther rotation of the camshaft will cause the exhaust valve to open. This does not happen immediately, for the piston will be on the firing stroke and the valves must be closed for a time. Turn the camshaft back to where the exhaust and inlet close completely, with the cam of the inlet in the position shown.

The Fourth Step

4—Slip the camshaft gear on to mesh with the one on the crankshaft. If a chain is used, it should be put on, keeping both crankshaft and camshaft in the proper position. Valves are now timed right, for if one cylinder is all right the rest follow, because the cams are integral on the camshaft.

5—Get the magneto in the right position. Revolve the armature shaft by hand until the breaker points are about to separate. This takes place when the fiber block on the end of the bell crank comes into contact with one of the cams on the inside of the interrupter housing.

6—Remove the cover of the distributer housing and note the position of the distributer arm. If it is on segment 1, it is in the correct position, otherwise the magneto will have to be turned over again.

7—Retard the spark fully.

8—Keeping magneto in this position, slip the gears in place so all mesh properly, as shown in the diagram.

While the diagram shows the timing positions for a four-cylinder job with magneto, it can be used for other engines and types of ignition systems as well. The repairman should bear in mind that the essential thing is to get the first cylinder piston set right with the valves and then get the spark position for it with the spark retarded. On some jobs better results are secured if the spark is not fully retarded. Then when it is fully retarded, the spark will occur with the piston about ¼ in. or so past top center. This is especially suited for engines that have to be cranked by hand.

The firing order of the engine shown is 1-3-4-2, but this can also be 1-2-4-3, in which case there will be a different arrangement of the wires going to the plugs. Sometimes setting the timing gears one tooth one way or the other after timing will give better running. Be careful in this respect with engines that are marked. If you have the

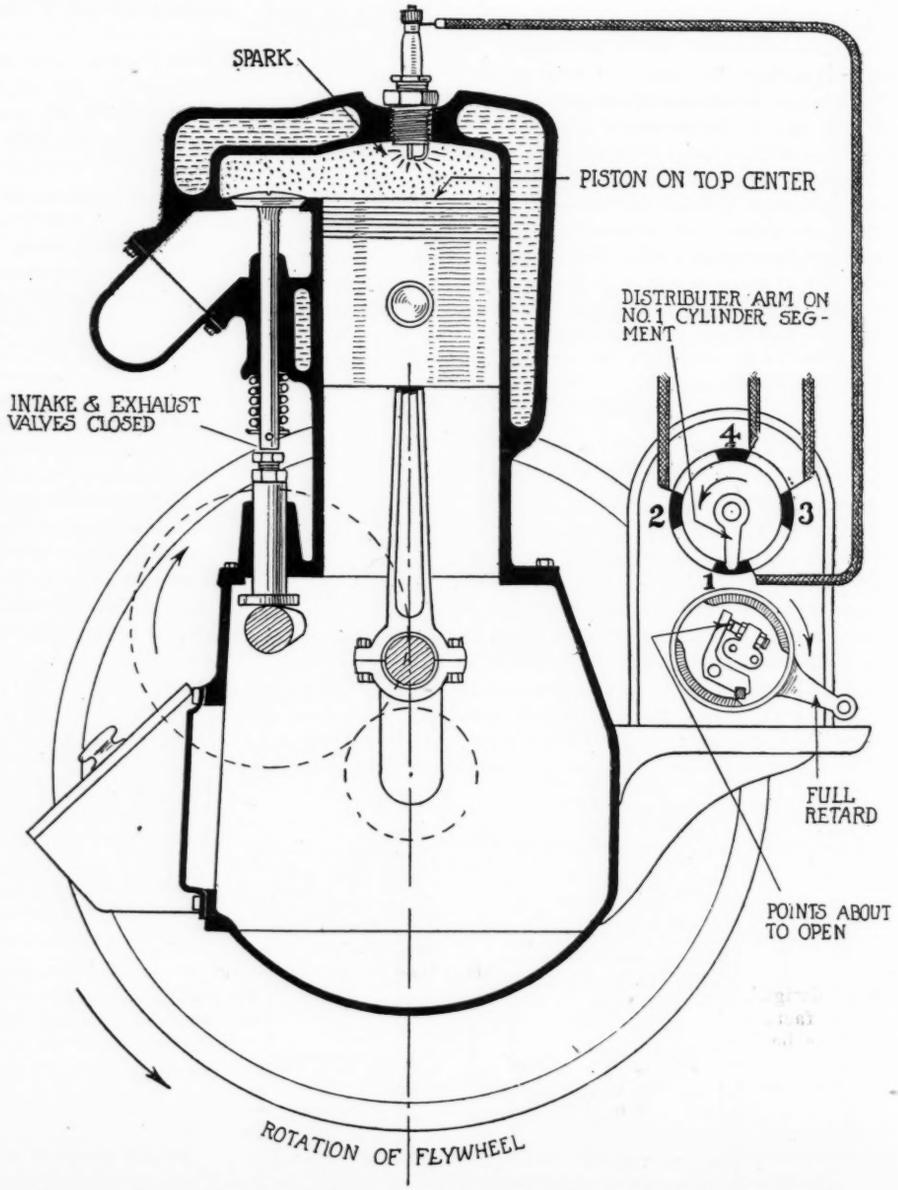


Diagram showing how four-cylinger engine is timed when using high-tension magneto

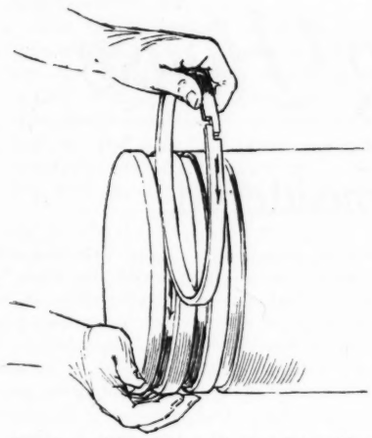


Fig. 1—Initial fitting of ring by rolling in its groove

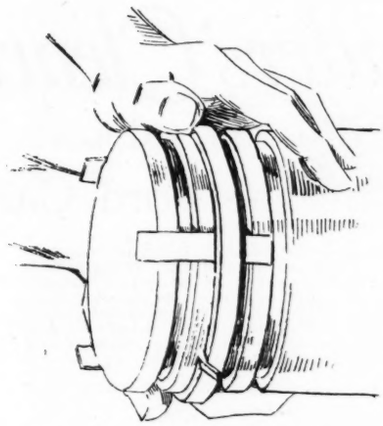


Fig. 2—Slipping ring over piston on saw blades

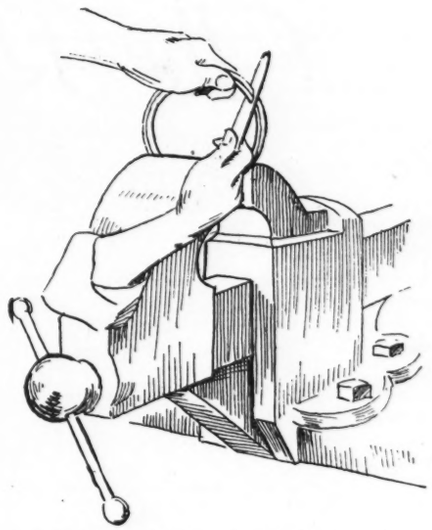


Fig. 3—Holding ring in vise for filing the ends

right timing as shown by the punch marks, let it go at that, as most of the timing gear teeth are too coarse to allow setting the camshaft one tooth either way. It will throw the timing off too much, the engine either not throttling down or else running with apparent loss of power.

Fitting Piston Rings

THE fitting of piston rings requires much accuracy. Many repairmen are satisfied if the ring merely fits into the guide in the piston. But so much is demanded of the rings that extreme care should be taken to get them fitted properly. Before putting in new rings the grooves in the pistons should be cleaned thoroughly by immersing the piston in kerosene and spraying thoroughly to get out every particle of dirt or carbon. Much time also can be saved by seeing which ring most nearly fits a given groove. Although all the rings and grooves are supposed to be exactly the same size, there is bound to be a little variation, and some needless grinding can be prevented if the rings are tried out first.

The First Step

The first step is to roll the piston ring around in the groove as shown in Fig. 1. The arrow shows the direction in which the ring should be moved. The entire circumference of the ring should be moved around in the groove. If the ring does not seem to fit the groove, try it in another. The reason the back end of the ring is fitted first instead of the inner is because the latter fitting would require that the ring be put in its usual position around the piston, and it is not always the easiest job to slip the rings over the pistons every time they are to be fitted for trial.

Having tested all the rings as in Fig. 1 the next step is to determine whether the ends are the correct distance apart. The distance between the ring ends when the ring is in the cylinder varies with the different designs. It is always the best to get the factory advice on this, if possible. They can be tested by placing the ring in the cylinder and bringing it down on top of the piston so it will be square with the walls. Then the joint can be seen. If the ends of the ring butt together, they should be filed slightly. The way to do this is shown in Fig. 3. The ring is placed in a vise with one end protruding about an inch. The file, a very fine mill file, is placed between the ends as shown and with the left hand the long end of the ring is pressed lightly against the file. Only a little filing is necessary, about a dozen strokes or so. The ring then is slipped back in the cylinder and the ends tested with a gage or feeler. If the factory measurement cannot be obtained 0.015 is a good distance to allow.

The next step is to make the ring fit the groove perfectly. This is done by lapping. A level steel surface is used for the job of grinding down the ring. Upon this surface is sprinkled enough fine emery dust to cover it, adding water to make the mass of a pasty consistency. The ring then is placed on the steel plate. A block of wood about 6 in. square is put on top of the ring and then, exerting slight pressure, the ring is carried back and forth over the emery, as on a washboard. If the ring will not stay under the block, cut a notch in it to hold the ring. Do not continue the lapping for a long time on one side of the ring only, but turn it over and take the other side. The entire operation should not take much over a minute. After the lapping process the ring should be washed with kerosene and fitted in the groove, not any groove but the one which it nearly fitted before. If every part of the circumference of the ring fits every part of the groove, then lapping is complete. Tag the ring to make sure it will be put in the right groove when the engine is assembled. For instance, call the first, or top, ring of No. 1 piston 1-1, the second, 1-2, etc. If one part of the ring fits and another part does not the high spot shows up when the ring is dipped in kerosene and then rubbed with a rag. The high spot is more shiny then the rest.

File High Spots

When high spots appear file perfectly flat and take a little off both sides. Take off just a little at a time and fit the ring back in the groove for trial. Take your time, as sloppy work here means trouble later on. When all the rings have been fitted in this manner the next step is to place them in their respective grooves, making them occupy the positions they would when in use.

The method shown in Fig. 2 is all right for this. There are devices on the market for this kind of work, but in the absence of these pieces of broken hacksaw blades will do very well. Ring No. 4 should be placed in position first. Use three pieces of saw blades, but grind off the teeth first. Hold one blade against the piston with the left hand and with the right bring one end of the ring in contact with the blade. Get the blade about ½ in. from the end of the ring, so you will be able to hold the blade in place by pressure against the ring. Then slip the ring over the top. There is now a space on each side of the blade through which the other blades can be slipped. Work the blades around until they appear as in Fig. 2. By sliding the ring down the blades it easily can be slipped into position. With the lapped ring in its groove, the ring must fit so that it can be turned around easily but with no up and down play.

NEW LIST OF PREFERENTIALS

Washington, Aug. 23—The War Industries Board is formulating a new list of preferred industries twice as long as the present list, which contains thirty-two classes. The extension of the list is due to widely expanded war needs and pressing demands of civilian origin. This new list will be used as a key to the relative importance of all the country's industrial enterprises. Each industry is being surveyed as to national needs and when the list once is established it will be maintained by a system of priority which will determine the use of the materials, facilities, fuel, transportation, labor and capital needed.

An important point in this new list lies in the fact that it will be used as an indication of what constitutes war work. The War Department's "work or fight" ruling will be made by men who are engaged in any of the classes of the essential industries listed. The new table may be expected within a week.

HARE IS PACKARD V. P.

Detroit, Aug. 25—Emlen S. Hare has been elected a vice-president of the Packard Motor Car Co. Mr. Hare will remain president of the Packard branch in New York but will be located here soon. The new office has been created as a result of the growth of the Packard's Government work.

The Readers' Clearing House

Conducted by B. M. Ikert

More Speed for the Ford Car Considered

LOS ANGELES, Cal., Editor MOTOR AGE —Two speeds forward on the Ford car are enough—when they are enough. Comes a time, however, when the high is too high, and the low is too low. Also, holding in a low speed pedal with a protesting left foot, palls on one after a time. Likewise the engine and the rear wheels never are disconnected positively, clutch or no clutch. The doubter has but to turn her over with the hand-brake not clamped firmly to hold the rear wheels.

Various skilled mechanics about the country have evolved secondary transmissions to go into the Ford car's driveshaft somewhere between clutch and rear wheels. Although the secondary transmission adds but one speed to the car, this speed added to either of the existing speeds gives a brand-new one, hence the four-speed advertisement.

Many on the Coast

Something like two-thirds of those that are well known are made on the Pacific coast, probably because it has the happy combination of many car owners and a considerable extent of country very much on end, albeit lined with good roads. One can worry along on the level, flat monotonous country roads on two speeds, but it is for the hill 15 miles long and 4 miles high that a trifle greater selection of gear ratios becomes most delightful, not to mention some arrangement that will keep the lower gear ratio in gear without staging an endurance contest between a left foot and an ever-increasing low-speed pedal spring.

The Ford gear ratio on the high is 3 7/11 to 1, which is higher than that of most sliding gear cars on the high but which is again cut down by the small size of the rear wheels. The low is 10 to 1, which is too high for a stubborn push out of a tight place where a slow, even delivery of power is essential to keep the car from drilling its way out of sight in the soft or sandy spot. Compare with this, the low ratio of a well-known car using much the same engine as the Ford, having a ratio of 17 to 1 on the low. The intermediate of the ordinary three-speed sliding gear car is anything from 7 to 1 to 12 to 1 but usually not below 9 to 1.

Where the high of the Ford would not pull, then there is the large and pleasing choice of stopping or going into the low. The gear ratio of low, while too high for stubborn work out of a tight place, is too low for a lot of spots where the rather high high speed would not work. In addition to this there is the grand business of turning around a peck or so of big and little gears in that planetary transmission, with plenty of noise, because the low gear of such a transmission is not efficient. And, too, you have to hold in the pedal with the foot —and some Californiana grades neatly adapted to the Ford low are only 8 or 9 miles long!

So they install a transmission case and gears in the driveshaft, to add a new speed to each of the two stock speeds. The line up in what is called the under-drive, is usually like this:

Ford high, 3 7/11 to 1.

New speed, or intermediate, obtained by shifting the secondary transmission gears, 7¼ to 1.

Ford low, 10 to 1.

New low, obtained with same gear in mesh as used for the new intermediate and pushing in Ford low pedal, 20 to 1.

Also in addition to the Ford reverse of 14 to 1, the new gears add another still lower reverse of 29 to 1.

The Devices Vary

To these additions to the Ford gear ratios, the four-speed transmission puts also the inducement that when it is in neutral there is a positive break between engine, clutch and forward end of driveshaft. Cranking is made easy because of removal of clutch drag, coasting is made possible on any little grade, with the resulting saving in fuel, while the car can be pushed around easily.

These devices vary according to the ideas of their designers. A typical and successful type, made in Los Angeles, furnishes the buyer with a new and shorter driveshaft, a transmission case, with the gears complete

Fig. 1—Four speeds for the Ford car. Views showing the gears and jaw clutch in neutral position, also side view of case showing gears always in mesh. The hand lever for shifting is easy to reach also

TO assist readers in obtaining as a unit all information contained in this department on a certain subject in which they may be most interested, MOTOR AGE segregates inquiries into divisions of allied nature. Questions pertaining to engines are answered under that head, and so on.

MORE SPEED FOR THE FORD CAR

ENGINES

O. F. Johnson.....Minneapolis, Minn.
A. W. Barthel.....New Athens, Ill.
George W. Odgers.Bradley Beach, N. J.

THE ELECTRIC SYSTEM

H. Spouder.....Cleveland, Ohio
C. R. McAdams.....Lake City, Iowa
I. Carl Mitchell.....Greensburg, Ind.
Walt W. Bissell.....Zearing, Iowa
Charles Brown.....Constellation, Ark.
Ralph L. York.....North Powder, Ore.
A. W. Turpin.....Deer Park, Wash.
Bluff City Electric Co .Memphis, Tenn.
N. J. Reed.....Emerson, Ill.

MISCELLANEOUS

P. K. Owen.....Grandfield, Okla.
Reader.....Sigel, Pa.
Ralph W. L. Ziegenbein.....
.....Houghton, Mich.
Edward T. Lewis.....
.....Washington Courthouse, Ohio
Reader.....Sharon, Pa.
H. Lain.....Laporte, Ind.

REBUILDING

Ray Weisenmayer.....
.....Fort Leavenworth, Kan.
Reader.....Norwalk, Ohio
Mills Cash Auto Supply Co.....
.....Fort Worth, Tex.

No communication without the writer's name and address will be answered in these columns.

inside, a gearshift lever and its base and a gearshifter rod.

The old driveshaft is taken out. The driveshaft housing or tube is cut off to offset the length of the transmission case, which then goes between the shortened driveshaft housing and the rear axle. Nothing of the standard Ford equipment is changed, save the shortening of the housing and the use of a shorter driveshaft.

Inside the neat, dust-proof case are four gears, always in mesh. The lower pair are machined, with their shaft, from a solid piece of steel. Gearshifting is done by a strong and simple jaw clutch sliding on the upper shaft. When the clutch is forward, the forward gear of the upper pair—lined with the driveshaft—is locked to the driveshaft and drives the lower pair of gears, which in turn, meshed with the rear gear of the upper pair, drive the rear wheels and give the reduction in ratio which produces the intermediate, or the lower low and reverse.

When Rear Gear Locks

When the clutch is pushed the other way, the rear gear is locked direct to the driveshaft, there is no reduction and the lower gears turn idly. With clutch half way, neutral, there is a positive break in the driveshaft. The gears turn on roller bearings and run in oil.

Instead of brazing rear end of driveshaft housing to the forward end of the transmission case, in this type it is clamped in a split sleeve with powerful bolts to set sleeve down around it, and there is no chance for breakage or altering of the metal by the high heat necessary in brazing.

Also the type is preferable to the sort in which the gears actually are shifted, for the reason that the powerful jaw-clutch can be engaged at any time without dependence on correct gear speed ratio. Because the Ford foot brake is rendered useless when a four-speed transmission is in neutral, the device offers dangerous possibilities unless there is some positive device for shifting out of neutral at high speed, or unless there is a pair of special brakes on the rear wheels. The Ford emergency brake cannot be depended upon to stop anything except some of the grease that leaks out of the differential—yet if a car gets away with the transmission in neutral and it cannot be instantly shifted into the locked position, the rear wheel hand brake is all there is left.

Not long ago in a car with trailer behind, coming down a steep hill in California, the gearshift lever of a faulty type of four-speed transmission, jolted the gears out of mesh into neutral. The car promptly started down the hill at a rate higher than the driver favored. The hand brake would not work, and the outfit went into the ditch.

Uses Friction Stop

One type uses only a little friction stop in the transmission itself, to guard against the hand lever jarring back and forth and jolting the gears out of mesh. A better arranged sort locks the lever itself at the base, by a pin at the bottom of the lever engaging in holes drilled in the base and held there by a heavy spring pushing the bottom of the lever sideways to keep the pin in the hole. The lever is made hollow to do away with the weight that aids in whipping to and fro on a rough road. For rough mountain work, for trucks or cars hauling more than normal Ford loads, the four-speed transmission about doubles the capacity of the Ford engine.

A particularly good combination of gear ratios can be had by putting into the rear end a larger drive pinion to make the normal Ford high-speed ratio 3 to 1 instead of nearly 4 to 1 as at present. Then there is the intermediate for intermediate work, and the two low speeds for hard pulling, while the 3 to 1 ratio on high gives nice level country going without excessive engine speed and resulting vibration.—Edward C. Crossman.

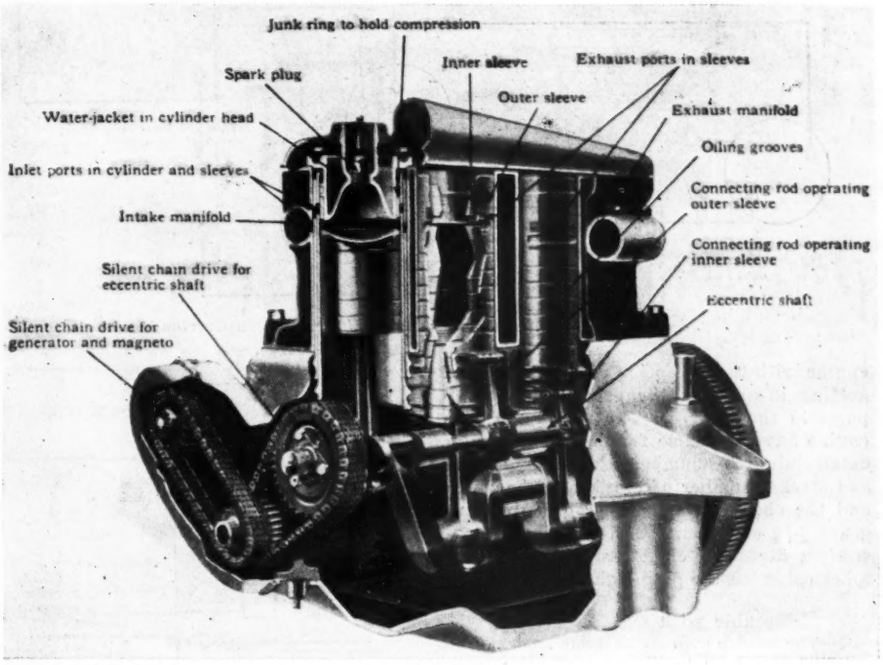


Fig. 2—Cutaway view of the Knight sleeve-valve engine used in the Willys-Knight. The sleeve valve action is shown clearly

Engines

Timing 1916 Inter-State

Q—Give the timing on the Beaver four-cylinder engine used in the Inter-State model T, 1916.—O. F. Johnson, Minneapolis, Minn.

In case the timing gears have been removed they can be put back in their relative positions by placing the marks on the gears coincident. The engine is timed so that the spark occurs when the piston is at top dead center on the compression stroke. The flywheel is marked showing top dead center and should be turned until this mark is at top of No. 1, or front, cylinder, when both valves of that cylinder are closed. The cover then can be removed from the timer, contact cam released and turned to contact position on circuit leading to No. 1 cylinder. The firing order of this engine is 1-2-4-3, and wires should be led from the timer in this rotation.

Details of Knight Engine

Q—I should like to have information and illustration of a Knight engine and its construction, as I have a Willys-Knight car.—A. W. Barthel, New Athens, Ill.

The Knight sleeve-valve engine outside of the valves has much in common with the conventional poppet-valve engine. Instead of poppet valves, the Knight engine has two cylindrical-shaped sleeves, or valves, per cylinder which slide up and down between the cylinder wall and piston, one working within the other. Ports, or openings, in these sleeves register with each other and with the cylinder ports at proper intervals, forming large unobstructed passages for the intake and exhaust gases.

Each sleeve is raised or lowered by a connecting rod from the eccentric shaft, the latter operated the same as a camshaft in a poppet-valve engine. The operation of the sleeve valves is thus positive, and the timing of the opening and closing cannot vary, no matter what the speed.

An illustration of the Knight engine is shown in Fig. 2. Like practically all other motor car engines this one is of the four-cycle type, that is, the piston makes four strokes, two up and two down, for every explosion that takes place. During the first downward stroke of the piston the valve ports, or openings, on the carbureter side come into register with each other and with the opening in the manifold. The gasoline vapor is drawn through this opening into the combustion chamber by the downward stroke of the piston.

When the downward stroke is complete the ports close and the upward stroke of the piston compresses the charge, which continues until the piston reaches the limit of its travel. At this point a spark occurs and the piston is forced down by the expansion of the gas. The momentum of the flywheel causes the crankshaft to continue to rotate and forces the piston upward again. During this upward stroke the valve ports in the exhaust side of the sliding sleeves come into register with each other and with the port in the exhaust manifold. The upward movement of the piston forces the exhaust gases out of the explosion chamber.

From this it will be clear that the action is much the same as in any other four-cycle

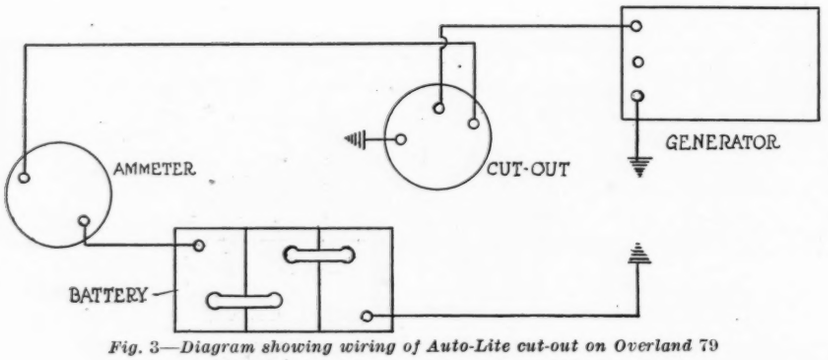


Fig. 3—Diagram showing wiring of Auto-Lite cut-out on Overland 79

engine with the exception of the manner of getting in and out the gases through the ports in the sleeves. The makers of this engine have the same freedom of choice in determining the number of cylinders, bore and stroke, number of crankshaft bearings and the choice between timing chains and gears. In addition, the sleeve valves permit an explosion chamber that is nearly spherical, with the plug right in the center.

Trouble with Old Engine

Q—The trouble with my Jackson, model 30, is that the valves get dirty in a very short time, as they are in a cage and there is no water around them. As a result, the exhaust valves get very hot in a short time. To grind the exhaust valves I have to remove the Atwater Kent ignition system and all the rocker arms before I can get at the valves. The exhaust cage is very hard to remove. I made the valve stem hole in the cage larger and made new valves to fit new holes in cases. I have had trouble with the rocker arms straightening out and also have had adjustments on the rocker arm, having to time each cylinder separately on account of the rockers not being the same shape. I removed the magneto and put on an Atwater Kent and put on a new Schebler carbureter, connecting it to the hot water from cylinders, also connecting carbureter to the stove on the exhaust pipe. The back cylinder is always oily. I put in new pistons with patent rings, and still the cylinder is oily. I have tried different kinds of spark plugs, but think the oiling system is bad. I try to keep the oil level as low as I can. I have studied it for six years and could not overcome the trouble.

Would it pay me to rebuild my car or buy a new one? I would need a new engine and body and many other things, and I would like to know which would be cheaper.—George W. Odgers, Bradley Beach, N. J.

The fact that you keep the oil level very low would account for your exhaust valves becoming hot. The first step in the way of overcoming your trouble is to fit a piston and rings in No. 4 cylinder properly.

When the cylinder becomes worn so badly that a new piston is necessary you, in nearly every instance, will find the cylinder out of shape. Of course, in that case a new piston or rings alone would have little beneficial effect. About the only remedy for your trouble is to have the cylinders rebored and new pistons and rings of the proper proportions fitted.

With regard to the rocker arms, we suggest that you purchase new ones from the factory. They are slightly larger and considerably harder.

We do not believe it would pay you to rebuild your car, as the parts are very expensive and becoming harder to obtain each year.

The Electric System

Wants 1914 Marion Wiring

Q—My generator does not keep my battery charged, and I think it may be due to wrong wiring. I have made a rough sketch of the wiring on the model B 1914 Marion car. The wire marked B on the generator goes to the coupling box and then to the negative side of the battery.

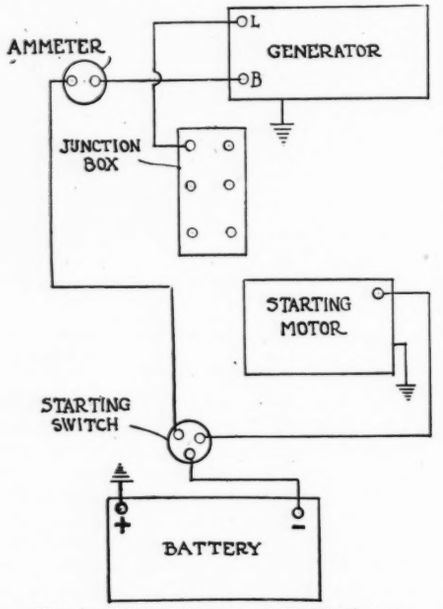


Fig. 4—Wiring diagram of Westinghouse system on 1914 Marion, showing ammeter

Also the negative side of the battery is grounded to the frame of the starting motor. Would not this arrangement act as a ground between the generator and the battery? I would like to connect in an ammeter. Show wiring diagram for connecting ammeter.—I. Carl Mitchell, Greensburg, Ind.

The correct way to wire up the different units you show in your sketch is shown in Fig. 4. The ammeter should be connected in the line going from the generator to the starting switch.

Oakland Wiring Diagram

Q—Publish wiring diagram of Oakland 6-42. As I am overhauling the car, I would like to put the starter from the running board under the front seat and take off dashlights.—H. Spouder, Cleveland, Ohio.

This is shown in Fig. 5.

Cut-Out on Overland

Q—What is the correct method of wiring in an Auto-Lite cut-out, or circuit-breaker, used instead of a regular Gray & Davis on a model 79 Overland? The starter has been disconnected, but the generator and the battery are still on.—C. R. McAdams, Lake City, Iowa.

The manner of wiring an Auto-Lite cut-out into a Gray & Davis system on the model 79 Overland is shown in Fig. 3.

Regulator Does Not Cut In

Q—What would cause the current regulator on a single-wire, two-unit Westinghouse system to fail to cut in? The car is a mid-season 1917 model Mitchell. The generator works properly and the voltage regulator screw functions all right, but the regulator armature will not close at any speed. When the armature bar is pushed down, making contact, the system operates normally, cutting out at excessive speed. The ammeter shows about 10 amp. at a car speed of 30 m.p.h. and cuts out at about 6 m.p.h. Decreasing the air gap between the armature bar and magnet makes no difference in operation. There seems to be no current passing through the current regulator until the cut-out is closed by hand. The system shows signs of having been tampered with considerably. The contact points on the armature open all right when the engine stops.

2—Would poor contact points in the switch of a Delco system be liable to cause overheating in switch? This car, an Oakland 34, showed discharge in the ammeter while running. Upon dissembling dash switch I found contact points on terminal of generator cable badly burned. The fiber block in which it is placed was charred considerably. I cleaned and trued up contact points, and it works perfectly. Could this have been caused by water getting in the switch, as the car had been driven a short time before in the rain with windshield open to facilitate seeing the road.—Walt W. Bissell, Zearing, Iowa.

1—The regulator to which you refer is a potential regulator and when working properly it so controls the generator that the current delivered to the storage battery is in proportion to the needs of the battery. Unless one is thoroughly experienced and fully familiar with the instrument it is not advisable to attempt any adjustment whatever, but since the instrument already has been tampered with possibly no additional harm can be done in attempting to repair it. Test your magnet and be certain it is not demagnetized. Next open up the winding of the armature bar at each end and run the current of two dry cells through it. In this operation watch closely for signs of heat, for if the windings are shorted it will heat up considerably. If there is a break in the winding, you will be unable to make any circuit with the dry cells. You might also inspect the moving parts for unnecessary frictional resistance caused by undue heat, or

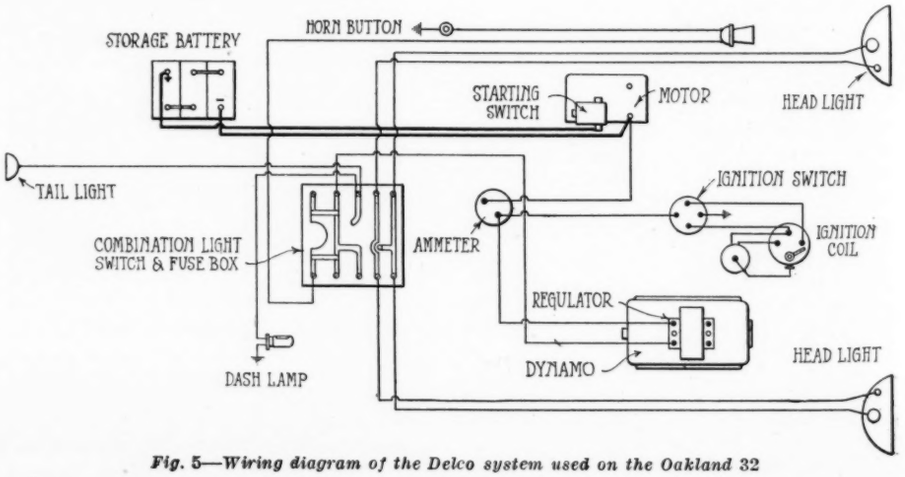


Fig. 5—Wiring diagram of the Delco system used on the Oakland 32

through distortion from being tampered with.

After following this course and making necessary repairs the regulator should not fail to operate and if working properly will deliver a strong current, 15 to 18 amp., to a battery in a state of low charge. When the battery is fully charged the regulator delivers a 5 to 8-amp. current, so that the battery plates will not be injured by excessive charging.

These charging rates are based upon a car speed of 30 m.p.h.

2—Yes. Poor contact points in the Delco switch, or, in fact, any switch, would cause overheating of the switch. We doubt that water was the cause of your trouble. It is very likely that the beginning of the heating is due to a poor contact on the throwing of the switch, which roughened the points, making your line at that point too light to carry the amperage.

Taillight on Ford

Q—Give instructions for wiring a taillight with power supplied from Ford magneto. Also state how much wire would be needed.—Charles Broan, Constellation, Ariz.

First make a connection at the magneto post, shown by M in Fig. 9. Run wire to the switch, which may be installed anywhere on dash. From the other pole on the switch run your wire down the dash to the frame and back to the rear, where the taillamp is placed. Connect this wire to one of the posts on the lamp and then, with a piece of wire just long enough to reach from the other post to the frame, ground it. About 15 ft. of wire is necessary.

Generator Does Not Charge

Q—I have a Detroit motor-generator, used on a Saxon, in my shop for repair. It will work as a starting motor but will not generate. The brushes are slightly worn, but I have had them out and cleaned them off so that they make fair contact with the commutator, and I have tried shifting them, that is, changing the brush holder so as to get the brushes in the proper plane with the field windings, but still it will not generate any current. It might be that I have not got the brushes in their proper places, and I would like to see a drawing of the proper places for the brushes, also a suggestion as to the remedy for this condition.—H. L. Blomgren, Wausa, Neb.

The concern that made this starting and lighting outfit is not manufacturing any more and we cannot get an illustration showing the position of the brushes. We are inclined to think that your trouble may be caused by brush trouble or some internal defect of the motor generator. The motoring of the generator is very important, as the same wiring and parts of the generator are used during this operation as when generating. Since you have removed the brushes you should have little difficulty in replacing them. We are inclined to think that new brushes will make a big difference in the running of the unit. When installed they should bear down evenly for their entire length. The brush holders should be examined to make sure there are no loose parts. Also look for high mica on the commutator. If the insulations between the commutator segments are raised too much, the generator will not function properly. Such an armature must be put in a lathe and dressed smooth and the mica insulations undercut so the brushes bear only on the copper or brass segments.

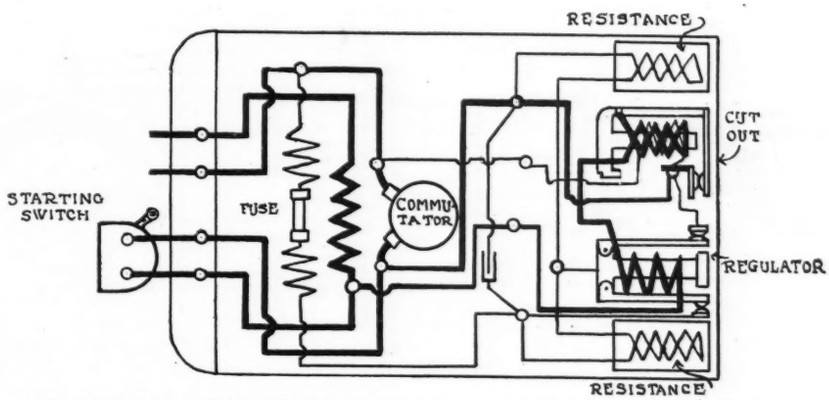


Fig. 6—Internal wiring diagram of the motor-generator used on the 1916 Dodge Brothers car

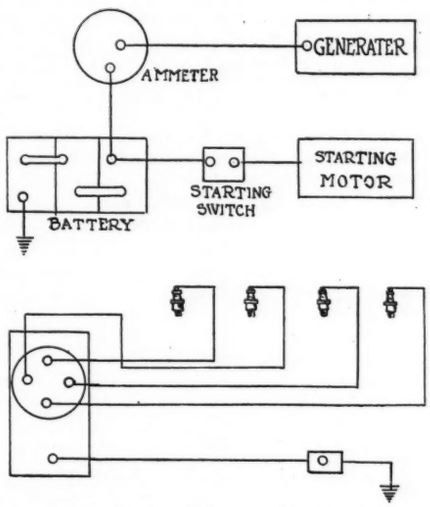


Fig. 7—Wiring diagram of lighting and ignition systems used on Knox tractor-truck

New Brushes in Generator

Q—I have an Overland model 75B, 1917, equipped with Auto-Lite generator, which is not delivering its full output because the commutator is dirty and needs new brushes. How do you clean commutator and remove old brushes and install new ones?—Ralph L. York, North Powder, Ore.

The commutator end of the generator is made accessible merely by removing the upper end plate on the generator as shown in Fig. 8. If the commutator is found to be blackened or rough, it may be dressed down with No. 00 sandpaper while the generator is running. Never use emery cloth for this. After smoothing down in this way examine it carefully and remove any particles of metal that may bridge across the insulation between the segments. Also blow out the carbon dust which may collect in the lower part of the generator case.

See that there is enough spring tension on the brushes to insure good contact with the commutator. Too much tension will cause unnecessary heating and wear of both the commutator and brushes. Keep commutator and brush chamber free from dirt and grease.

There is nothing difficult about putting in new brushes. Simply open up the end of the generator and you will see how the brushes are held in the holders. Always when replacing brushes see that the whole end of the brush is in even contact with the commutator. Both of the brush holders must be insulated carefully from the generator case. If any of the insulation plates, bushings or washers are found inoperative, they must be replaced with new ones.

Electric System on Knox

Q—Publish a wiring diagram of the electric system used on the Knox tractor-trailer.—A. W. Turpin, Deer Park, Wash.

This diagram is shown in Fig. 7.

North East Motor Wiring

Q—Publish internal wiring diagram of the motor-generator used on the 1916 Dodge Brothers car. This is the North East system. We are having a great deal of trouble with the unit, as it seems the internal connections are wrong. —Bluff City Electric Co., Memphis, Tenn.

The internal connections of this system are shown in Fig. 6.

Breaker Point Distance

Q—What is the correct distance of spark gap at the breaker? I removed the breaker block and found that one point had a small hole in it and the other had a small point projecting from it. Are they manufactured this way, or is it a

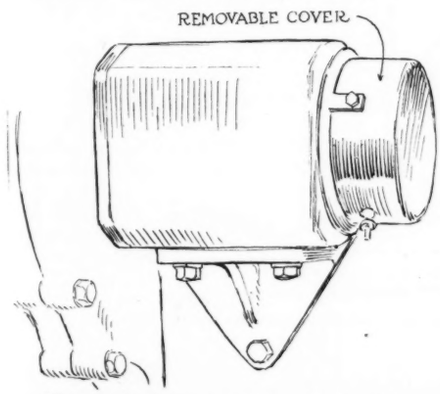


Fig. 8—Generator on Overland 75B, showing end plate that admits to commutator end of the generator

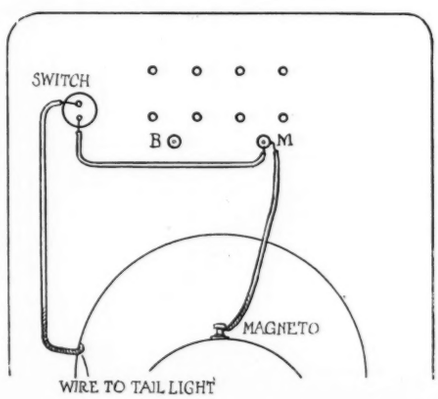


Fig. 9—Diagram to show how connections are made on Ford car for taillight

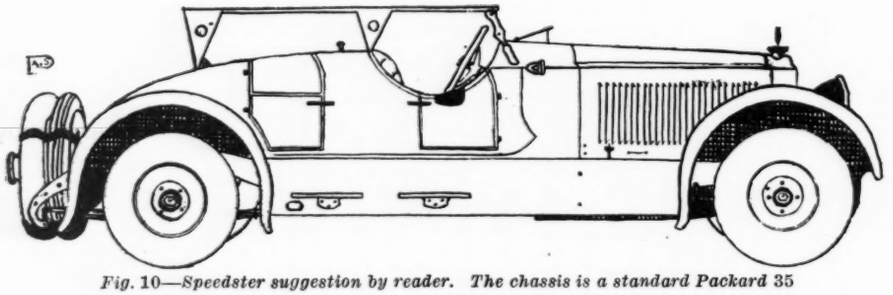


Fig. 10—Speedster suggestion by reader. The chassis is a standard Packard 35

defect caused by use?—Ralph L. York, North Powder, Ore.

An average gap of $\frac{1}{64}$ in. will serve an all-around purpose.

The points on the breaker are defective and are not manufactured as you describe. The two points should present a perfectly flat surface and, if they appear otherwise, should be filed down and adjusted.

Wants to Charge Battery

Q—I have a generator which is rated at 1 kw. and is used to charge a fifteen-cell, 30-volt storage battery for electric lighting. What apparatus would it be necessary to use with the generator to charge a three-cell Willard battery used in Studebaker cars? Would it be possible to cut out three cells from my fifteen-cell battery and connect the Willard battery in the circuit in place of the other three cells?—M. J. Reed, Emerson, Ill.

We believe it would be satisfactory for you to connect your storage battery in the manner mentioned, that is, by cutting out three cells of the fifteen-cell battery and connecting in the Willard battery.

Cleaning Auto-Lite Commutator

Q—Can the commutator of the starter be cleaned satisfactorily on a Chevrolet 490 without removing it from the frame? This is an Auto-Lite.

2—I bought a new set of six dry batteries and connected them up to an induction coil used on a Mitchell gas engine, 12 hp., using make-and-break ignition. These batteries tested from 22 to 30 amp. I connected them in series. After two days' use, the batteries tested 2 to 4 amp. and glue-like substance leaked around the top. Could the wires have been connected to the coil wrongly?—Ralph L. York, North Powder, Ore.

1—You do not have to take the starting motor off to clean the commutator. Simply remove the sheet metal cover on the front end of the starter which gives access to the brushes and commutator.

2—Connecting the batteries up wrong would not cause them to act this way unless, of course, they were so connected that there was a dead short, which would run them down very fast. A defective switch or coil may have caused them to become exhausted also. The glue-like substance probably was due to a chemical action in the cells, owing to rapid running down of the current.

Miscellaneous

Wants to Paint Car

Q—I find the paint on my car is still good, but it is very dull. I would like to re-varnish it myself. What is the method used by regular painters?

2—Where can I get the best varnish, and what kind and size of brush should I use?—P. K. Owen, Grandfield, Okla.

See MOTOR AGE for Aug. 22, Reader's Clearing House, which gives instructions for painting a car. Any good paint store can supply you with varnish. Use a 2-in. brush.

His Friction Drive Slips

Q—I have a CarterCar transmission which I am using as the means of changing power on a machine to pull wells. A few days ago some crude oil got on the fiber in the friction wheel. After this was done I was unable to get any friction out of it. I cleaned it all off with gasoline and let it dry. This did not help it any, except for a few turns. I filed and sandpapered it well, but it does not help. I also put on Fuller's earth, and as long as I put it on I had good friction, but if it was not put on for a few turns it would slip as badly as ever. It always had a black color and would hold good; now it gets copper color. This coloring seems to come out of the fiber and get on the disk. The friction wheel runs true with the disk and is a perfect fit from one side of the fiber to the other against the disk. The fiber is just as hard as it ever was and, when cleaned off, looks just the same as it did before.—Reader, Sigel, Pa.

It is possible that the introduction of oil on the fiber of your friction wheel has caused the disk to wear flat, or there may be a series of flats. About the only remedy we have to offer is that the fiber be placed in a lathe and cut down just enough to insure its being absolutely true. It does not take much of a flat surface to cause slipping.

Wants Cyclecar Information

Q—I would like some information about the installation of a Saginaw friction transmission, which I am going to put in my Dayton cyclecar. How can I move the friction disk, that is fastened on a shaft to the flywheel, to move up against and away from the fiber wheel?

2—Is the American cyclecar still on the market, and from whom can I get particulars of same?

3—Where can parts be secured for the friction from the Saginaw, and who made this transmission?—Ralph W. L. Ziegenbein, Houghton, Mich.

1—We have no specifications to show just what sort of friction transmission was used on the Saginaw cyclecar, but the layout shown in Fig. 11 may be of help in getting it installed. In any friction set there must be sufficient pressure between the disk and follower wheel and it does not matter much in what way this pressure comes, so long as it is there.

In the illustration pressure is obtained by using a foot pedal working on a notched quadrant. In this way it is possible to lock the pedal in any position and vary the tension, for great tension is not necessary when the going is good and the load light. A spring serves to pull the disk away from the follower wheel. The end of the shaft carrying the disk should be mounted in a sleeve to make a sliding bearing. The rest of the apparatus is set up in the conventional manner, that is, the follower wheel is fitted on a keyed shaft so it will turn with it but is also free to slide sideways to vary the speeds.

2—So far as we know this concern is not on the market any more.

3—We do not know who made the friction gearset of the Saginaw, but suggest that you write to the Rockwood Mfg. Co., Indianapolis, Ind., which concern made many of the friction gearsets of these light cars. This concern also issues a booklet on friction transmission which would be of service to you.

Removing Squeaks

Q—How can I take squeaks out of the springs and other parts of a car?—Reader, Sharon, Pa.

Remove each of the springs and separate all the leaves. Scrape off any paint or rust which may appear and polish to a very smooth finish. Then graphite them thoroughly before reassembling. Be sure that the spring clips are not too tight when you have finished. Go over the entire car and tighten all bolts and nuts, especially body bolts. Also inspect the steering gear joints for wear.

Studebaker Gear Ratio

Q—In your issue of July 25 you state that the Studebaker six is geared 3.7 to 1. Is this a mistake? I have a Studebaker six, 1916, and I thought it was geared 4 to 1.

2—How fast will this car go when it is in good condition? It will not run over 40 to 45 m.p.h. now. Should it run faster, or not?

3—What can be done for loose universal joints?

4—How many miles per gallon should this car go at present? We are getting about 10 m.p.g.

5—Do you have to take the engine out of the frame to take up the rear bearing in a 1916 Studebaker?

6—Will the pistons all come out by removing the crankcase?—Edward T. Lewis, Washington Courthouse, Ohio.

1—The gear ratio of the Studebaker model ED is 3.7 to 1.

2—This particular model Studebaker is

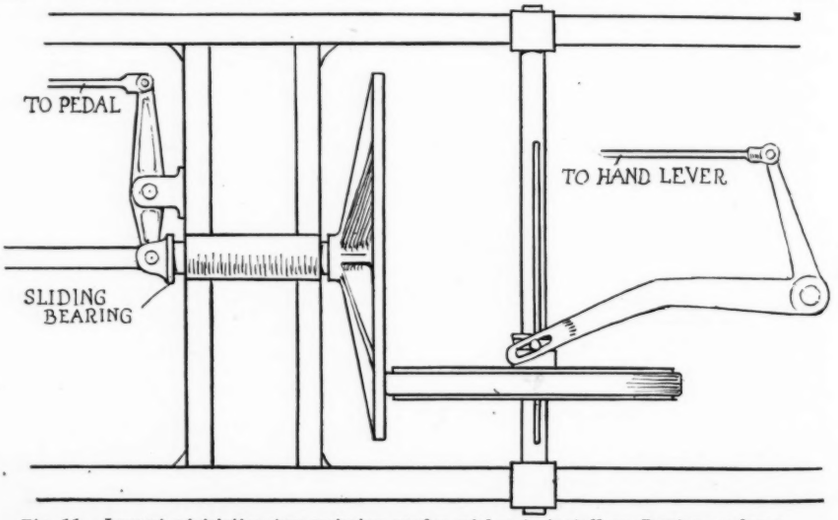


Fig. 11—Layout of friction transmission reader wishes to install on Dayton cyclecar

not what would be termed a fast car. Forty-five to 50 m.p.h. is all that should be expected of it under very favorable conditions.

3—If the universal joint has developed considerable wear on account of insufficient lubrication, the better repair would be to replace the joint with a new one.

4—With your engine in good condition, carbureter properly adjusted and no undue frictional resistance your car should average 14 m.p.g.

5—It is not necessary to remove the engine rear main bearing. Simply remove the crankcase and the bearing can be conveniently reached.

6—Yes, the pistons may be removed from the lower part of the engine by revolving the crankshaft to different positions for clearance.

Rebuilding

Wants to Rebuild for Speed

Q—I am about to build a racing car for the ½-mile track and intend to use a 1918 Dodge Brothers. I would like to know how to underslung this car by using the same axles, also, how to shorten the wheelbase to about 104 in., rebore the cylinder, use alloy aluminum piston and ream out the valve ports so I can use larger valves. I also intend to use Rudge-Whitworth wire wheels of the racing type and 33 by 5 tires and expect to change the gear ratio. Do you think by these changes I will be able to get 80 to 90 m.p.h. out of this car?

2—I would like to get a picture and also size and dimensions of the body of the Peugeot that Dario Resta drove in 1916.—Ray Weisenmayer, Fort Leavenworth, Kan.

1—You are undertaking quite a job, and, what is more, we hardly believe you will be able to get 80 or 90 m.p.h. out of the car after you have gone to all the trouble outlined. In the first place you will have great difficulty in underslinging the frame, as this is not possible with the type of frame used on this car. Also very few racing cars are now made with an underslung frame. It is true the cars are hung low, but this is accomplished by employing flat springs hung from the under side of the axles, with a decided kick-up in the frame at the rear. Cantilever springs are used in some cases. Our suggestion would be to change the present shape of the frame to the form shown in Fig. 12, and get new springs for it with the leaves as flat as possible. You can rivet an extension on the rear end of the frame so semi-elliptic springs can be used to replace the three-quarter elliptic. Wherever the frame has to be bent it must be heated to a dull red. Be sure that the front horns line up correctly. You can do this by the method shown in Fig. 13, using rods and spirit levels. It is very essential to get the frame lined up correctly. If it is not, the car will not handle well on the turns.

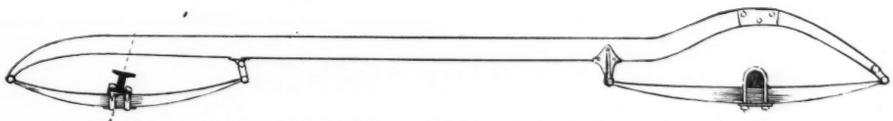


Fig. 12—Side view of frame to be used with Dodge Brothers car converted into racing car

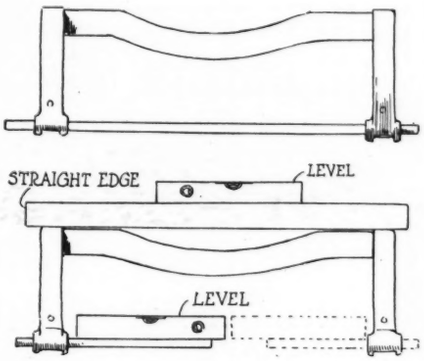


Fig. 13—After straightening, the frame horns can be lined up with rods and spirit levels

Shortening the wheelbase means that you will have to cut off the driveshaft and tube, brake rods, etc. The driveshaft and tube probably will mean the hardest work, and this should be done at the forward end, where the shaft connects with the front universal. The tube after it is cut off can be welded again.

In regard to the aluminum pistons we suggest that you take this matter up with the concerns making light-weight pistons, sending them one of the old iron pistons you wish to replace. Also give the manufacturers the exact size in thousandths to which you are going to bore out, as this will insure them sending you the right size pistons. Also if you ream out the valve ports and fit larger valves, you should put on a larger carbureter, as it does little good to increase the openings into the cylinders if there is not an increase also in the amount of gas fed. A special camshaft also would increase your speed; but this means expense. All told we do not believe you will get much more than 70 or 75 m.p.h. out of this car with the changes you suggest. Really the results you obtain will depend a great deal upon how much time and money you are willing to spend on the job. In building over a stock car there is no limit to the work you can do if you want to speed it up. The maximum speed obtained is wholly dependent upon what you do. Enlarging the valves, boring out the block, larger carbureter, different gear ratio, lighter pistons, etc., all help to increase the speed if the work is done right. You will have to use your judgment in doing the work, and if you have not had much experience along these lines you had better have someone who understands speed work help you.

2—We have no blueprints or other specifications that show the dimensions of this body and we doubt whether they can be obtained, as this sort of information generally is withheld pretty close by the racing men.

Reader Suggests Speedster

Norwalk, Ohio, Editor MOTOR AGE—Here is a design of a four-passenger convertible sport roadster. It is mounted on a Packard chassis in this case, but it could be mounted on any chassis with about a 135-in. wheelbase. In this case the lines of the standard Packard are adhered to closely. A standard Packard hood is used. The headlamps and sidelamps are also Packard. A ventilator is fitted in the front cowl to cool the front compartment in warm weather. Individual fenders of crown design are used, curving far over the disk wheels. There being no running boards, entrance is gained by small steps. The rear compartment may be opened or closed quickly. The disappearing top for the front compartment is kept in the center cowl when not in use. In the rear of the body an extension top is stored. This extension is used when the car is used as a four-passenger. There is also a compartment in the rear of the car for luggage. Two spare tires are carried at the rear of the car.—Reader.

Commercial Body for Ford

Q—Furnish sketch for body, for use on Ford chassis, on the following lines: Cab for driver to be entirely inclosed, glass in front, back at side of driver and full length doors with glass in upper panel. This is necessary because the car will have to go in all weather. The rear part is to be open flareboard body about 5 ft. long. It is to be as light as possible, as no heavy loads will be carried, and the cab must be as low as possible so as not to look top-heavy. This is to be built on a 1914 chassis, without cowl dash.—Mills Cash Auto Supply Co., Fort Worth, Tex.

A suggestion for an open flare body with cab is shown in Fig. 14. If you want to, the body could be brought over the rear wheels far enough so no fenders would be necessary. Make the windows so they will drop into pockets in the sides of the cab. In this way you will be able to ventilate in warm weather.

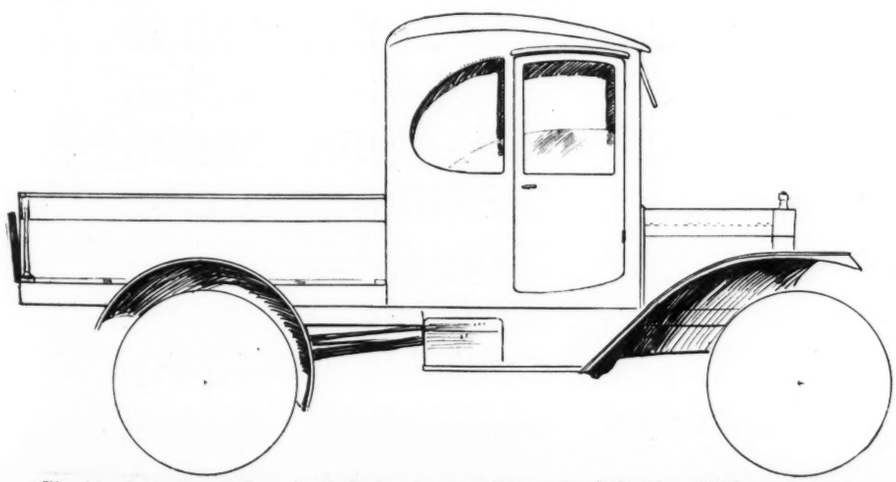


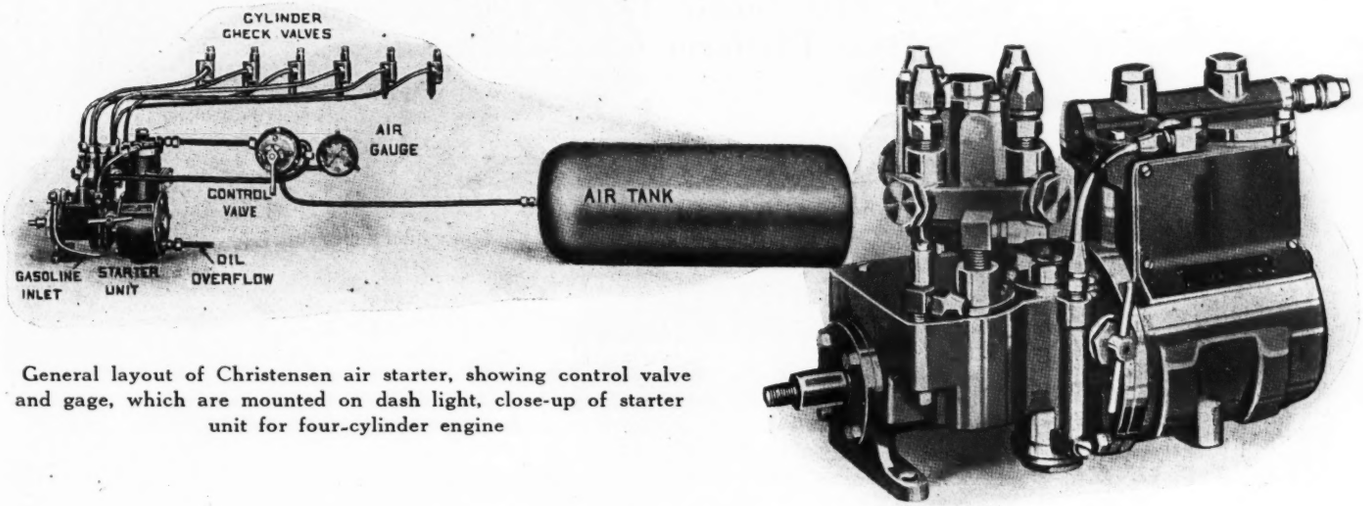
Fig. 14—Open flare body and cab design for mounting on Ford chassis. Windows drop into sides for ventilation

Piston Displacement Chart for Four-Cylinder Engines, Any Bore and Stroke

STROKES IN INCHES — LIMIT OF ERROR 0.04 CUBIC INCHES

Bore, Inches	3	3 1/8	3 1/4	3 3/8	3 1/2	3 5/8	3 3/4	3 7/8	4	4 1/8	4 1/4	4 3/8	4 1/2	4 5/8	4 3/4	4 7/8	5	5 1/8	5 1/4	5 3/8	5 1/2	5 5/8	5 3/4	5 7/8	6	6 1/8	6 1/4	6 3/8	6 1/2	6 5/8	6 3/4
3	84.8	88.4	91.9	95.4	99.0	102 5	106.0	109.6	113 1	116.6	120.2	123 7	127.2	130.8	134.3	137.8	141.4	144 9	148.4	152.0	155.5	159.0	162.6	166.1	169.6	173.2	176.7	180.2	183.8	189 3	190.8
3 1/16	88 4	92.0	95.7	99 4	103.1	106.8	110.5	114.2	117.8	121 5	125.2	128.9	132.6	136.3	139.9	143.6	147.3	151.0	154.7	158.4	162 0	165.7	169.4	173 1	176.8	180.5	184.1	187.8	191.5	195.3	198.9
3 1/8	92.0	95 9	99.7	103.5	107.4	111.2	115.0	118.9	122.7	126.5	130.4	134 2	138.1	141.9	145.7	149 6	153.4	157.2	161.1	164.9	168.7	172.6	176.4	180.2	184.1	187.9	191.7	195.6	197.4	203.2	207.1
3 3/16	95.8	99.7	103.7	107.7	111.7	115.7	119.7	123 7	127.7	131 6	135.6	139.6	143.6	147.6	151.6	155.6	159 6	163.5	167.5	171.5	175.5	179.5	183.5	187.5	191.5	195.5	199.5	203.4	207.4	211.4	215.1
3 1/4	99.5	103.7	107.8	112.0	116.1	120.3	124.4	128.5	132.7	136 8	141.0	145.1	149.3	153.4	157.6	161.7	165.9	170 0	174.2	178.2	182.5	186.6	190.8	194.9	199.1	203 2	207.3	211.5	215.6	219 8	223.9
3 5/16	103.4	107.7	112.0	116 3	120.6	125.0	129.3	133 6	137.9	142.2	146.5	150.8	155.1	159.4	163.7	168.0	172.4	176.7	181.0	185 3	189.6	193.9	198.2	202.5	206.8	211.1	215.5	219.8	224.1	228.4	232.7
3 3/8	107.4	111.8	116.3	120.8	125.3	129.7	134.2	138.7	143 1	147.6	152.1	156.5	161 0	165.3	170.0	174.5	178.9	183.4	187.9	192.4	196.8	201.3	205.8	210.3	214.7	219.2	223.7	228.1	232 6	237.1	241.5
3 7/16	111.5	116.1	120.8	125 4	130.0	134.7	139.3	144.0	148.6	153 3	157.9	162.5	167.2	171.8	176.5	181.1	185 8	190.4	195.1	199.7	204.3	209.0	213.6	218.3	222.9	227.6	232.2	236.8	241.5	246.1	250.8
3 1/2	115.4	120 3	125.1	129.9	134.7	139.5	144.3	149.1	153.9	158.7	163.5	168.4	173.2	178.0	182.8	187.6	192.4	197.2	202.0	206.8	211.6	216.5	221.3	226.1	230.9	235.7	240.5	245.3	250.1	254 9	259.7
3 9/16	119.6	124.6	129.6	134.5	139.5	144.5	149.5	154 5	159.5	164 4	169 4	174.4	179.4	184.4	189.4	194.3	199 3	204.3	209 3	214 3	219 3	224.3	229.2	234.2	239.2	244.2	249.2	254.2	259.2	264.1	269.1
3 5/8	123.7	129.0	134.2	139.3	144 5	149.7	154.8	160.0	165.1	170 3	175.5	180.6	185.8	190.9	195.3	201.3	206.4	211.6	216.7	221.9	227.1	232.2	237.4	242.5	247.7	252 9	258.0	263.2	268 3	273.5	278.7
3 11/16	128.2	133.5	138.8	144.2	149.5	154.8	160.2	165 5	170.9	176.2	181.5	186.9	192.2	197.6	202.9	208.2	213.6	218 9	224.3	229.6	234.9	240.3	245.6	251.0	256 3	261.6	267.0	272.3	277.7	283.0	288.3
3 3/4	132.5	138.0	143.6	149.1	154.6	160.1	165.6	171.2	176.7	182.2	187.7	193 3	198.8	204.3	209.9	215.4	220.9	226.4	231.9	237.4	242.9	248.5	254.0	259.5	265.0	270.5	276.1	281.6	287.1	292.6	298.2
3 13/16	137.0	142.7	148.4	154 4	159.8	165.5	171.3	177.0	182.7	188 4	194.1	199.8	205.5	210.7	216.9	225.6	228.3	234.0	239.7	245.4	251.2	256 9	262.6	268.3	274.0	279.7	285.4	291.1	296.8	302.5	308.2
3 7/8	141.5	147.4	153.3	159.2	165.1	171.0	176.9	182.8	188.7	194.6	200.4	206.4	212.3	218.2	224.0	229.9	225.8	241.7	247.6	253.5	259.4	265.3	271.2	277.1	283.0	288.9	294.8	300.7	306.6	312.5	318.4
3 15/16	146.1	152.2	158.3	164.4	170.5	176.5	182.6	188.7	194.8	200.9	207.0	213.1	219.2	225.3	231.3	237.4	243.5	249.6	255.7	261.8	267.9	274.0	280.0	286.1	292.2	298.3	304.4	310.5	316.6	322.7	328.7
4	150.8	157.1	163.4	169.7	175 9	182.2	188.5	194.8	201.1	207.4	213.6	219.9	226.2	232.5	238.8	245.0	251.3	257.6	263.9	270.2	276.5	282.8	289.0	295.3	301.6	307.9	314.4	320.5	326.7	333.0	339.3
4 1/16	155.5	162.0	168.5	175 0	181.5	188.0	194.4	200 9	207.4	213.9	220.3	226.8	233.3	239.8	246.3	252.8	259.2	265.7	272.2	278.7	285.2	291.6	298.1	304.6	311.1	317.6	324.1	330.5	337.0	343.5	350.0
4 1/8	160.4	167.0	173.7	180.4	187.1	193.8	200.5	207.1	213.8	220.5	227.2	233 9	240.5	247.2	253.9	260.6	267.3	274.0	280.6	287.3	294.0	300.7	307.4	314.0	320.7	327.4	334.1	340.8	347.5	354.1	360.8
4 3/16	165.3	172.2	179 0	185 9	192.8	199.7	206.6	213.5	220.4	227.2	234.2	241.0	247.9	254.8	261.7	268.6	275.4	282.3	289.2	296.1	303.0	309.9	316.7	323.6	330.5	337.3	344.2	351.1	355.8	364.9	371.8
4 1/4	170.2	177.3	184.4	191.4	198 5	205.6	212.7	219.8	226.9	234.0	241.1	248 2	255.3	262.3	269.4	276.5	283.6	290.7	297.8	304 9	312.0	319.1	326.3	333.4	340.4	347.5	354.6	361.7	368.8	375 9	383.0
4 5/16	175.3	182.6	189.9	197.2	204.5	211.8	219.1	226 4	233.7	241.0	248 3	255.6	262.9	270.2	277.5	284.8	292.1	299 4	306.7	314.0	321.3	328.6	335.9	343.2	350.5	357.8	365.1	372.4	379.7	387.0	394.3
4 3/8	180.4	187.9	195.4	202 9	210 5	218.0	225.5	233.0	240.5	248.0	255.5	263.1	270.6	278.1	285.6	293.1	300.7	308.2	315.7	323.2	330 7	338.2	345.8	353.3	360.8	368.3	375.8	383.3	390 9	398.4	405.9
4 7/16	185.6	193.3	201.1	208 8	216.5	224.3	232.0	239.7	247.5	255.2	262.9	270.7	278.4	286.1	293.8	301.6	309 3	317.1	324.8	332.5	340.2	348.0	355.7	363.4	371.2	378.9	386.7	394.4	402.1	409.8	417.6
4 1/2	190.9	198.8	206.8	214.7	222.7	230.6	238.6	246.5	254 5	262.4	270.4	278 3	286.3	294.2	302.2	310.2	318.1	326.1	334.0	341.9	349.9	357.8	365.8	373.7	381.7	389.6	397.6	405.5	413.5	421.5	429.4
4 9/16	196.2	204.4	212.5	220 7	228.9	237.1	245.2	253.4	261.6	269 8	278.0	286.1	294.3	302.5	310.7	318.8	327.0	335.2	343.4	351.5	359.7	367.9	376.0	384 2	392 4	400.5	408.7	416.9	425.1	433.3	441.4
4 5/8	201.6	210.0	218.4	226.8	235 2	243.6	252.0	260.4	263 8	277.2	285.6	294.0	302.4	310 8	319.2	327.6	336.0	344.4	352.8	361.2	369 6	378.0	386.4	394.8	403.2	411.6	420.0	428.4	436.8	445 2	453.6
4 11/16	207.1	215.7	224.3	233.0	241.6	250.2	258.9	267.5	276.1	284.7	293.4	302.0	310.6	319 2	327.9	336.5	345.1	353 8	362.4	371.0	379.6	388.3	396.9	405.5	414.2	422.8	431.4	440.1	448.7	457.3	465.9
4 3/4	212.7	221 5	230 4	239 2	248 1	257.0	265.8	274.7	283.5	292.4	301.2	310.1	319.0	327.8	336.7	345.6	354.4	363.3	372.1	381.0	389.9	398.7	407.6	416.4	425.3	434.1	443.0	451.9	460.7	469 6	478.4
4 13/16	218.3	227.4	236.5	245 6	245.7	263.8	272.9	281 9	291.1	300.1	309.2	318.3	327.4	336.5	345.6	354.7	363.8	372 9	382.0	391.1	400.2	409.3	418.4	427.5	436.6	445.6	454.7	463.8	472.9	482.0	491.1
4 7/8	224.0	233.3	242.6	252.0	261.3	270.6	280.0	289.3	298.6	308.0	317.3	326.6	336.0	345.3	354.6	364.0	373.3	382.6	392.0	401.3	410.6	420.0	429.3	438.8	443.0	457.3	466.6	476.0	485.3	494.6	503.9
4 15/16	229.8	239.3	248.9	258.5	268.1	277.6	287.2	296.8	306.3	315.9	325.5	335.1	344.6	354.2	363.8	373.4	382.9	392.5	402.1	411.6	421.2	430.8	440.4	449.9	459 5	469.1	478.7	488.2	497.8	507.4	516.9
5	235.6	245.4	255.3	265.1	274.9	284.7	294.5	304.3	314.1	324.0	333.8	343.6	353.4	363.2	373.0	382.9	392.7	402 5	412.3	422.1	431 9	441.8	451.6	461.4	471.2	481.0	490.8	500.6	510.5	520 3	530.1
5 1/16	241.5	251.6	261.7	271.7	281.8	291.9	301.9	312.0	322.1	332.1	342.2	352.2	362.3	372.4	382.4	392.5	402 6	412.6	422.7	432.8	442.8	452.9	463.0	473.0	483.1	493.1	503.2	513.3	523.3	533.4	543.5
5 1/8	247.6	257.9	268.2	278.5	288.8	299.1	309.4	319.8	330.1	340.4	350.7	361.0	371.3	381.6	392.0	402.3	412.6	422.9	433.2	443.5	453.8	464.2	474.5	484.8	495.1	505.4	515.7	526.0	536.4	546.7	557.0
5 3/16	253.6	264.2	274.7	285.3	295.9	306.5	317.0	327.6	338.1	348.7	359.3	369.8	380.4	391.0	401.5	412.1	422.7	433.2	443.8	454.4	465.0	475.5	486.1	496.7	507.2	517.8	528.4	538.9	549.5	560.0	570.6
5 1/4	259.8	270.6	281.4	292.2	303.0	313.9	324.7	335.5	346.3	357.2	368.0	378.8	389.6	400.4	411.3	422.1	432.9	443.7	454.6	465.4	476 2	487.0	497.8	508.7	519.5	530.3	541.2	552.0	562.8	573.6	584.4
5 5/16	266.0	277.1	288.2	299 3	310.3	321.4	332.5	343.6	354.7	365.7	376.8	387.9	399.0	410.1	421.2	432.3	443.3	454.4	465.5	476.6	487.7	498.7	509.8	520.9	532.0	543.1	554.2	565.2	576.3	587.4	598.5
5 3/8	272.3	283.7	295.0	306.4	317.7	329.0	340.4	351.7	363.1	374.4	385.8	397.1	408.5	419.8	431.2	442.5	453.9	465 2	476.5	487.9	499.2	510 6	521.9	533.3	544.6	556.0	567.3	578.6	590.0	601.4	612.7
5 7/16	278.6	290.3	301.9	313.5	325.1	336.7	348.3	359.9	371.5	383.1	394.7	406.3	418.0	429.6	441.2	452.8	464.4	476.0	487.6	499.2	510.8	522.4	534.0	545.7	557.3	568.9	580.5	592.1	603.7	615.3	626.9
5 1/2	285.1	297.0	308.8	320.7	332.6	344.5	356.4	368.2	380.1	392.9	403.8	415.7	427.6	439.5	451.4	463.3	475.2	487.0	498.9	510.8	522.7	534 5	546.4	558.3	570.2	582.0	593.9	605.8	617.7	629.6	641.4
5 9/16	291.6	303.7	315.9	328 0	340.2	352.3	364.5	376.6	388.8	400.9	413.1	425.2	437.4	449.5	461.7	473.8	486.0	498.1	510.3	522.4	534.6	546.7	558.9	571.0	583.2	595.3	607.5	619.6	631.8	644.0	656.0
5 5/8	298.2	310.6	323.1	325.5	347.9	360.3	372.7	385.2	397.6	410.0	422.4	434.9	447.3	459.7	472.1	484.6	497.0	509.4	521.8	534.2	546.7	559.1	571.6	584.0	596.4	608.8	621.2	633.6	646.1	658.5	670.9
5 11/16	304.9	317.5	330.2	343.0	355.7	368.4	381.0	393.7	406.5	419.2	431.9	444.6	457.3	470.0	482.7	495.4	508.1	520.8	533.5	546.2	558.9	571.6	584.3	597.0	609.7	622.4	635.1	647.8	660.5	673.2	685.9
5 3/4	311.6	324.6	337.6	350.6	363.5	376.5	389.9	402.5	415.5	428.5	441.4	454.4	467.4	480.4	493.6	506.4	519.4	532 3	545.3	558.2	571.3	583.2	597.2	610.2	623.2	636.2	649.2	662.1	675.1	688.1	701.1
5 13/16	318.4	331.7	344.9	358.2	371.5	384.7	398.0	411.3	424.5	437.8	451.1	464.3	477.6	490.9	504.1	517.4	530.7	544.0	557.2	570.4	583.7	597.0	610.3	623.6	636.8	650.0	663.3	676.6	689.9	703.1	716.4
5 7/8	325.3	338.8	352.4	366.0	379.5	393.1	406.6	420.1	433.7	447.3	460.8	474.4	487.9	501.5	515.0	528.6	542.2	555.7	569.2	582.8	596.3	609.9	623.4	637.0	650.6	664.1	677.7	691.2	704.8	718.4	731.9
5 15/16	332.2	346.0	359.9	373.7	387.6	401.4	415.3	429.1	442.9	456.8	470.6	484.5	498.3	512.2	526.0	539.8	553.7	567.6	581.4	595.2	609.0	622.9	636.7	650.6	664.4	678.2	692.1	705.9	719.8	733.6	747.4
6	339.3	354.4	367.6	381.7	395.8	410.0	424.1	438.2	452.4	466.5	480.6	494.8	508.9	523.0	537.2	551.3	565.5	579.6	593.7	607.8	622.0	636.2	650.3	664.4	678.5	692.7	706.8	721.0	735.1	749.2	763.4
6 1/16	346.4	360.8	375.2	389.7	404.1	418.5	433.0	447.4	461.8	476.3	490.7	505.1	519.6	534.0	548.4	562.9	577.3	591.7	606.2	620.6	635.0	649.4	663.9	678.4	692.8	707.2	721.6	736.0	750.5	765.0	779.4
6 1/8	353.5	368.2	383.0	397.7	412.4	427.2	441.9	456.6	471.4	486.1	500.8	515.6	530.3	545.0	559.7	574.5	589.2	604.0	618.7	633.4	648.2	662.8	677.6	692.4	707.5	721.8	736.5	751.2	766.0	780.7	795.4
6 3/16	360.8	375.8	390.8	405.9	420.9	435.9	451.0	466.0	481.1	496.1	511.1	526.1	541.2	556.2	571.2	586.3	601.3	616.4	631.3	646.4	661.4	676.4	691.5	706.5	721.0	736.6	751.6	766.6	781.7	796.8	811.7
6 1/4	368.1	383.5	398.8	414 2	429.5	444.8	460.2	475.5	490.8	506.2	521.5	536.8	552.2	567.5	582.9	598.2	613.6	628.9	644.2	659.6	674.9	690.2	705.6	721.0	736.3	751.6	767.0	782.2	797.6	813.0	828.3
6 5/16	375.5	391.2	406.8	422.5	438.1	453.8	469.4	485.1	500.7	516.4	532.0	547.6	563.3	579.0	594.6	610.3	625.9	641.6	657.2	672.8	688.5	704.1	719.8	735.4	751.0	766.8	782.4	798.0	813.7	821.3	844.9
6 3/8	383.0	399.0	414.9	430.9	446.8	462.8	478.8	494.7	510.7	526.6	542.6	558.5	574.5	590.4	606.4	622.4	638.4	654.3	670.2	686.2	702.1	718.2	734.1	750.0	766.0	782.0	797.9	813.9	829.8	845.8	861.7
6 7/16	390.6	406.8	423.1	439.4	455.7	471.9	488.2	504.4	520.7	537.0	553.3	569.5	585.8	602.1	618.4	634.6	650.9	667.2	683.5	699.7	716.0	732.2	748.5	764.8	781.1	797.4	813.6	829.9	846.2	862.5	878.7
6 1/2	398.2	414.7	431.3	447.9	464.5	481.1	497.7	514.3	530.9	547.5	564.0	580.7	597.2	613.8	630.4	647.0	663.6	680.2	696.8	713.4	729.9	746.6	763.2	779.8	796.3	812.9	829.5	846.0	862.7	879.2	895.8

Christensen Self-Starter System



General layout of Christensen air starter, showing control valve and gage, which are mounted on dash light, close-up of starter unit for four-cylinder engine

THE Christensen self-starter system is built on the principle of furnishing compressed air charged with a proper proportion of gasoline or volatile fuel vapor, so as to form an explosive mixture. It has been used extensively for aircraft engines and made its first appearance on a tractor installed on the John Lauson Mfg. Co. tractor. As installed in this case the starter would cost the consumer about $250. The Christensen Engineering Co., Milwaukee, Wis., is, however, bringing out a starter for tractors that is to cost the consumer in the neighborhood of $125.

Make-Up of Outfit

The whole outfit comprises a small air compressor, clutch to link it to the engine, automatic carbureter capable of instantly converting the compressed air into gasoline gas under all pressures above that of the atmosphere, automatic distributer, air reservoir and control valve by which the functions are controlled from the driver's seat. The compressor, carbureter, clutch and distributer are one unit and weigh from 12 to 30 lb., depending on the model. The outfit takes up about as much space as a magneto. A four-cylinder starter unit is shown herewith.

To start the engine with this starter, the ignition switch is set, handle of control valve on starter turned to left and, by pressing the central button, air is admitted to the starter carbureter, mixed with gasoline and distributed into the cylinders in firing order. This air and gasoline mixture being under compression immediately starts the piston downward, the spark ignites the charge and starts the cycle of operation. The same thing happens in the cylinder next to fire and so on, until the pressure on the control valve button is released. The control valve and air gage are small and ordinarily placed on the instrument board. The air reservoir can be placed in any convenient place on the car.

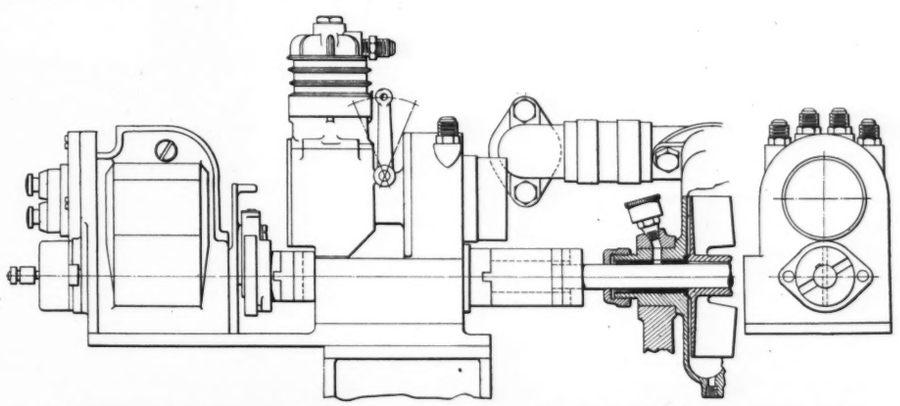
To replenish air in the reservoir, the handle of the control valve is turned to the opposite side and upon the pressure being applied to the central button air from the reservoir passes through the control valve to the clutch mechanism and engages the compressor clutch. As the compressor is in action it automatically holds the clutch in engagement until the handle is turned to the neutral position. When a sufficient pressure has been attained, the handle is turned to neutral and the clutch immediately disengages and leaves the compressor inactive.

The air reservoir also can be used for tire inflation by a simple connection between the inflator nozzle on the selector valve and the tires. This same nozzle also can be used to charge the reservoir from an outside source, such as air bottle or pump. To inflate tires the handle of the selector or control valve is placed in a slot cut between the neutral and starting positions and connection made between the inflator nozzle and tires. Then by prepressing the central button air flows directly from the reservoir to the tires.

Several different sizes and models are made, but in action all are alike. In installing it is necessary to know the bore and stroke of the engine, number of cylinders and direction in which the starter is to be driven. Driving connections are in all cases positive, and, while this can be done by chain and sprockets, the direct form of driving, like an Oldham coupling, as shown in the tractor installation, herewith, is to be preferred to any other kind.

To ascertain the number of times the engine could be started without recharging the tank or reservoir tests were made with the results shown in the accompanying table. It also shows the amount of reduction in pressure after each start and the number of seconds required for starting, counting the time from pressure of the button until the engine was started on its own power. The engine after each start was brought to a standstill by switching off the ignition.

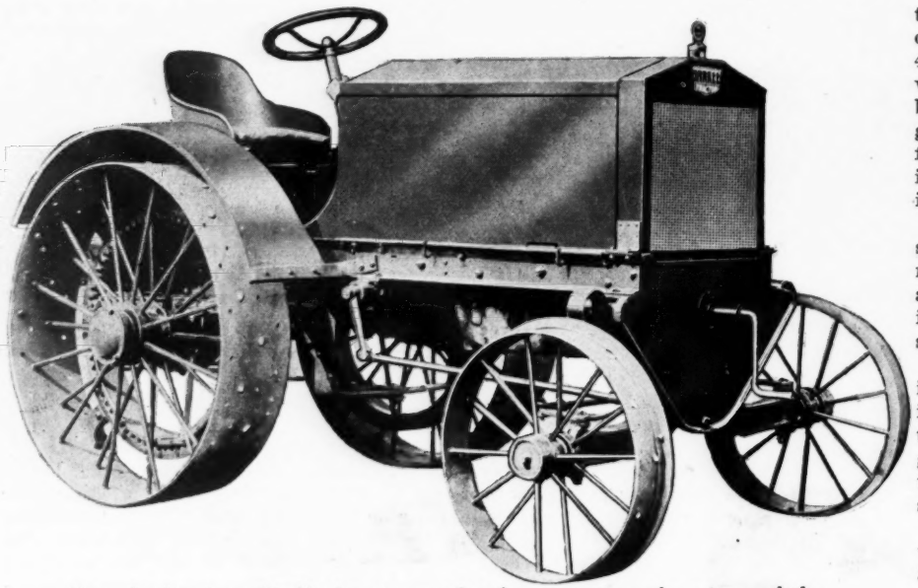
		REDUCTION		
		TANK PRES-	IN PRES-	TIME FOR
	TANK PRES-	SURE AFTER	SURE EACH	START SEC-
STARTS	SURE	START	START	ONDS
1	250	245	5	1.5
2	245	235	10	1.25
3	235	225	10	1.
4	225	212	13	1.1
5	212	200	12	1.5
6	200	190	10	1
7	190	180	10	1.5
8	180	170	10	1.4
9	170	165	5	1.5
10	165	155	10	1.5
11	155	145	10	1.6
12	145	140	5	2.0
13	140	130	10	2.1
14	130	120	10	2.2
15	120	110	10	2.2
16	110	100	10	2.0



Christensen starter installation on tractor, showing it coupled between magneto and pump. An Oldham coupling is used

Accessibility Marks the Yankee

Tractor Has Single Lever Control and Rear Platform for Operator



Note the hood on this Yankee tractor for the protection of engine and the comfortable seat provided for the operator

THE distinctive features of the Yankee tractor, which is manufactured by the American Tractor Corp., Peoria, Ill., are the single lever control, the accessibility of parts, simplified lubrication and the rear platform for the operator.

The Yankee tractor is of four-wheel type, with two drive wheels in the rear and two steering wheels in front, one of each running in the furrow. It rates as a 12-25, with a reserve power which gives it a maximum drawbar pull of 2600 lb. at recommended plowing speed and a maximum horsepower of 31 at normal engine speed.

Attention is called by the company to the fact that the Yankee tractor, as far as is possible, is composed of standard parts. These include such equipment as Hyatt roller bearings, Kingston carbureter and ignition, truck-type fan and radiator cooling system and motor car type of steering gear.

Erd Engine Used

The engine is an Erd, of open flywheel type, four-cylinder, 4 by 6 in., vertical, valve-in-head, with a recommended revolution of 925 per minute. The diameter of the crankshaft is 2 in. with three bearings. The wristpin diameter is 1¼ in. Ignition is by Kingston high-tension magneto, with impulse starter and automatic spark control. Cooling is by fan and Modine cellular tion of water. The fan has 1800 r.p.m.; the pump speed is 925 t.p.m.; and the water capacity is 6 gal. Lubrication is constant-level splash and circulating pump. The recommended fuel is kerosene.

Only one grade of oil is used in lubricating the Yankee, and there are but two places to oil, the crankcase and in the rear end casting which forms the gear housing. The gears run in oil constantly. Oil is fed to them by the splash system and by a force pump which pours a constant stream of oil on each set of gears when running. On the whole tractor, outside the engine, there are but two grease cups. These are on the hubs of the front wheels and require filling but once a month.

The clutch is Borg & Beck, single-plate disk-type. Clutch control is by foot pedal on operator's platform. The pulley take-off is direct through bevel gear. The pulley is located at the rear of the machine, is 11 in. in diameter, with a 7-in. face and has revolutions per minute of 925.

The gearset is of the sliding gear, selective type, with three speeds forward and one reverse. Speed range is from 1½ to 4¾ m.p.h. The gears are of nickel steel with minor gears machined. The gearset bearings are Hyatt. Final drive is internal gear, with gears rough cast and of 3-in. face. The diameter of the differential shaft is 2¼ in. and that of the intermediate shaft is 1¾ in.

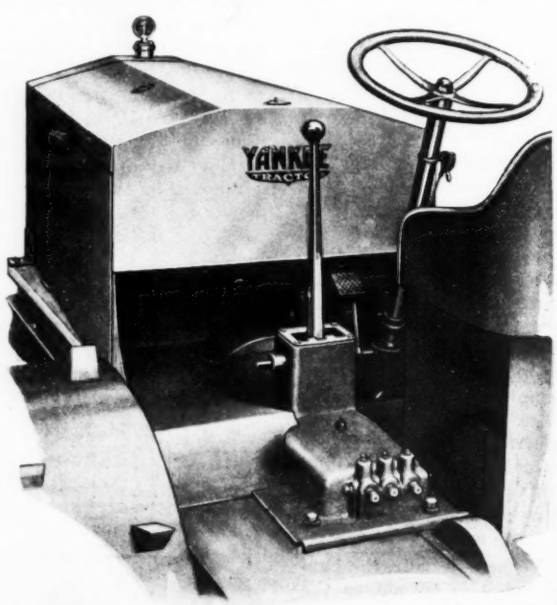
Motor car practice is followed in the steering gear, which is Jacox make and right-hand location, completely inclosed and dust-proof. The location of the steering gear and the height of the operator's seat give clear vision ahead.

The drive wheel axle is a fixed type, 2½ in. in diameter, and has Hyatt roller bearings. The front axle is cast steel, H-section, with plain bearings and trunnion pin, giving flexibility. The front end of the tractor is mounted on a transverse leaf spring.

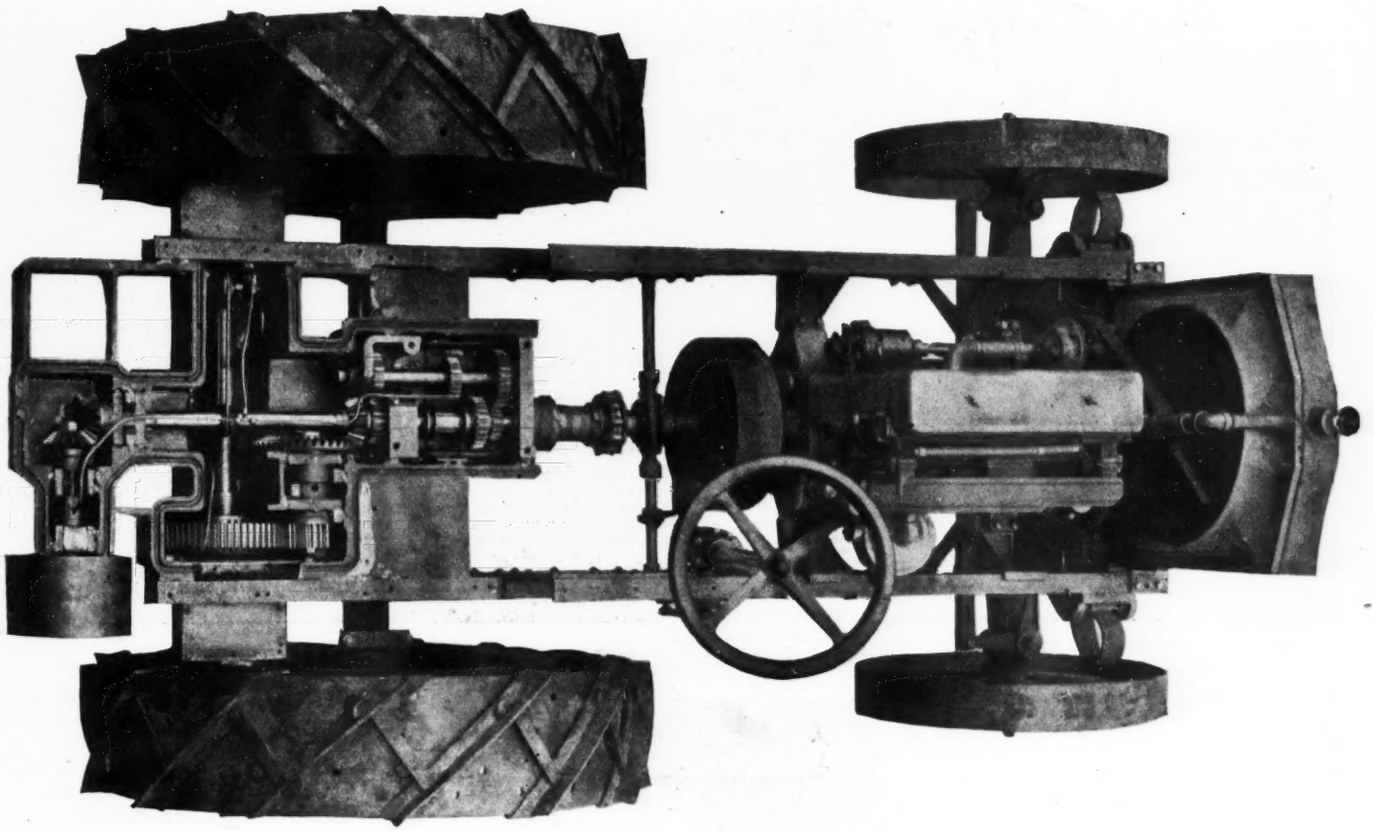
The drive wheels are 48 in. in diameter with a 12-in. face, and the front wheels are 30 in. in diameter and have a 5-in. face.

The length of the Yankee is 132 in. over all, 71 in. wide and 58 in. high. The wheelbase is 75 in. The Yankee weighs 4200 lb., less fuel and water. The turning radius is 8½ ft. It is recommended for 3 14-in. bottoms at normal plowing speed and will operate a 20 by 24-in. separator. It has a full-floating drawbar which may be adjusted to any height by a chain, thus facilitating hitching to any make of engine equipment.

Control is very simple, as will be noted by reference to the illustration. One lever controls all forward speeds and reverse as well as the belt pulley. The clutch is disengaged by the foot pedal, and the lever can be set to any speed desired, and upon release of the pedal the tractor starts.



Operator's platform on Yankee tractor, showing single lever control and foot pedal for clutch

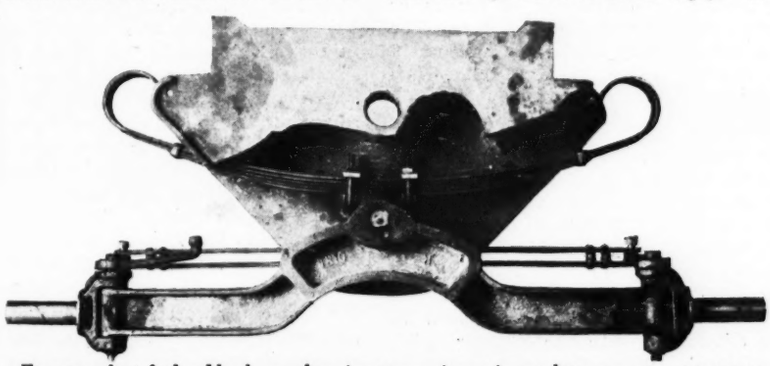


Airplane view of Yankee tractor, showing unit construction, universal joint between clutch and gearset, lay-out of gearset and pulley take-off

Every working part of the Yankee tractor is readily accessible. By removing the cylinder head and oil pan the entire engine is made accessible for examination or repair. By removing the operator's platform floor the entire gearset, gears, shafts, axle, etc., is completely exposed and can be got at from the top side. When in place the rear end construction of the gearcase protects the gears completely from dust and dirt.

The manufacturers claim that the only tools necessary to effect examination or repair of the Yankee tractor are a monkey wrench and a screwdriver. It is claimed also that the most inaccessible gear in the machine can be taken out and replaced in an hour's time by one man and a helper.

The rear platform of the Yankee is a great convenience. From it tillage implements can be regulated. It also can be utilized for the carrying of surplus fuel and oil and for working tools. The comfort of the operator has been considered in the design and location of the seat. This has a lazyback and there is plenty of leg room and foot rests are conveniently placed on the platform.



Front axle of the Yankee, showing trunnion pin and transverse spring

VALUABLE TRACTOR INFORMATION

A mass of valuable tractor information has been put into the possession of trade and agricultural publications as a result of the labors of the publicity committee appointed last January at a joint conference of the Tractor and Thresher Department of the National Implement & Vehicle Association and the Agricultural Publishers' Association.

The information collected by the committee consists of the answers made by seventeen of the leading tractor manufacturers of the country to seventy-nine questions propounded by the committee. These questions cover practically every phase of the tractor situation and the answers give in detail the opinions of the manufacturers who are qualified to make reply. The answers have been collated and compiled and have been issued in mimeographed form.

Copies of the compilations are limited in number and the distribution of them has been confined to the manufacturers who answered the questions, to members of the Agricultural Publishers' Association and to a selected list of trade and technical publications.

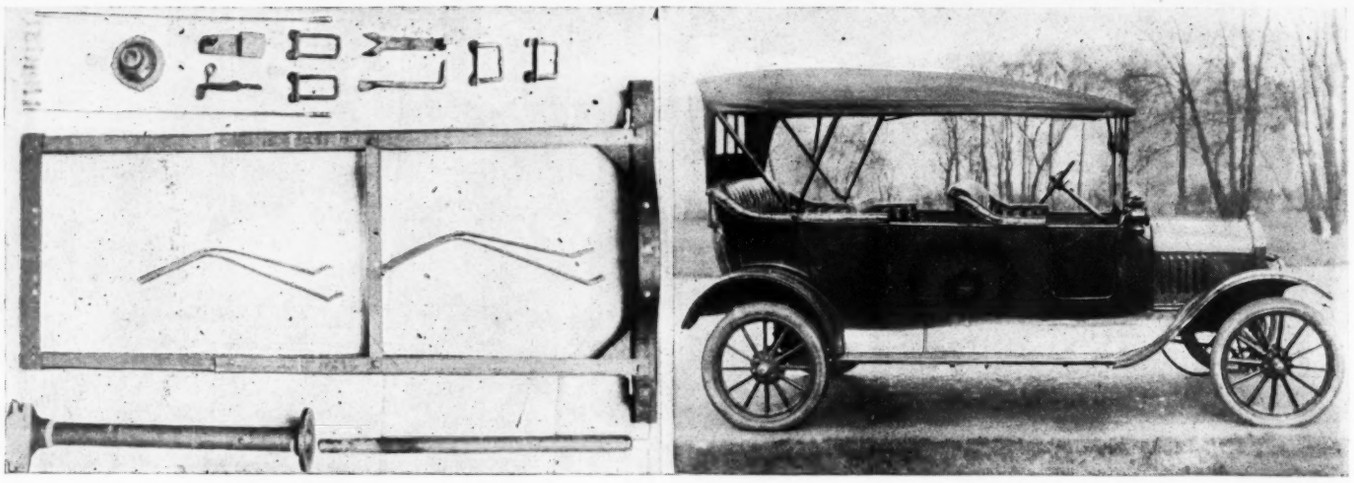
The object of the distribution is to place in the hands of publishers reliable and first-hand information concerning tractors to be used in a campaign of education directed to tractor dealers and tractor users. No restrictions save that of editorial discrimination has been placed upon the use of the information.

TO LIMIT COAL STORAGE

Washington, Aug. 23—The passenger car industry in Michigan will be limited in bituminous coal storage to a twenty-day supply to be delivered after preferential industries, which includes the motor truck industry, are given a forty-five day supply. The industry in other states will be limited to a fifteen-day supply after preferred industries receive a supply from 20 to 30 per cent. Public utilities will receive supplies ranging from thirty to ninety days before the non-preferred industries are supplied. All non-preferred industries are completely cut off from future shipments of by-products and gas coal.

Coal in excess of these storage limitations, which are considered sufficient for current operations, will not be delivered to non-preferred plants for use before April 1, 1918, unless there is a surplus over the demands of the preferred consumers.

The Accessory Corner



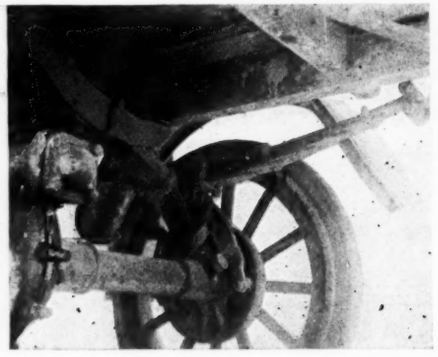
McIntyre extension to provide for body 90 in. long back of seat, left; and 18-in. extension for Fords

Johnson's Freeze-Proof

"JOHNSON'S Freeze-Proof" is the name of a booklet issued for the express purpose of educating the company's trade and sales people in the advantages of Freeze-Proof and to overcome the prejudice against the use of manufactured anti-freeze preparations. The booklet contains complete information about the preparation and directions for its use and care of the radiator. In addition it describes the Freeze-Proofometer, which is a specially-designed hydrometer which will indicate instantly the condition of the solution, not only the freezing temperature it will withstand but also the amount of Freeze-Proof to a gallon in the solution. The scale goes to 60 deg. Fahr., and shows the amount necessary to withstand the average temperature of a given locality. The Freeze-Proofometer is furnished gratis to dealers, one to each, who are handling the product.—S. C. Johnson & Son, Racine, Wis.

McIntyre Extension for Fords

The McIntyre 18-in. extension for Ford cars increases the room between seats from 21 inches to 39 in. The rear seat can be removed, and this gives 55 in. of loading space, enough to carry seven milk cans and other articles. The change is made from passenger to commercial car or back again in less than 60 sec., it is claimed. The company also makes a 30-in. extension for Fords and supports the side members by truss rods. In the former the 18-in. extension panel is inserted just back of the rear door. The additional cross and side braces are mitered, glued and screwed. The outside metal is fitted accurately and the heads of the screws are soldered. Side channels 42 in. strengthen and lengthen the frame. Running boards, top, floor and shaft are lengthened. This provides room for a seat for two additional passengers, making a seven-passenger out of the five-passenger Ford. Complete equipment for the extension is furnished and includes linoleum and metal binding on the running board, floor carpet and two additional 18-in. curtains. By this equipment the owner of a Ford car can make it into a seven-passenger car. The truck-maker includes two sturdy additional springs placed parallel with the length of the chassis and extending it to accommodate a body 60 in. long back of the seat. A heavy truss rod reinforces the rear axle and housing. An extension is made to extend and strengthen the Ford chassis to balance a body 90 in. back of the seat. Prices, 18-in. extension, $150 for four-bow top and $200 for one-man top; truck-maker, $40; extension for 90-in. body, $50.—McIntyre Motor Products Co., 100 Garfield boulevard, Chicago.



McIntyre truck-maker, showing it installed

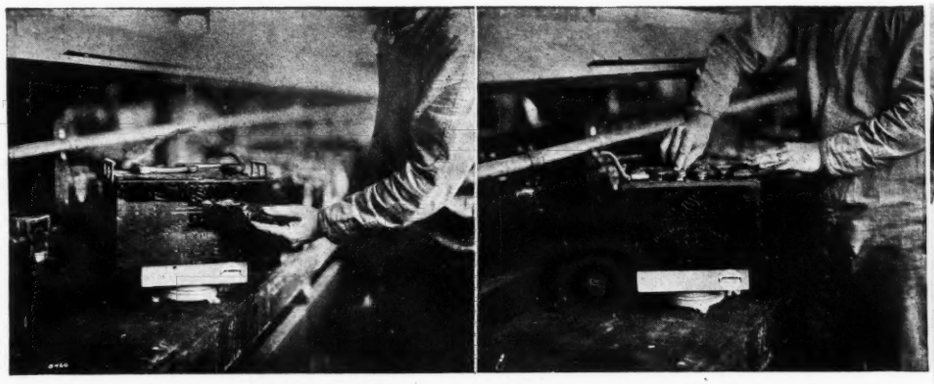
Service Equipment

Buda Valve Lifter

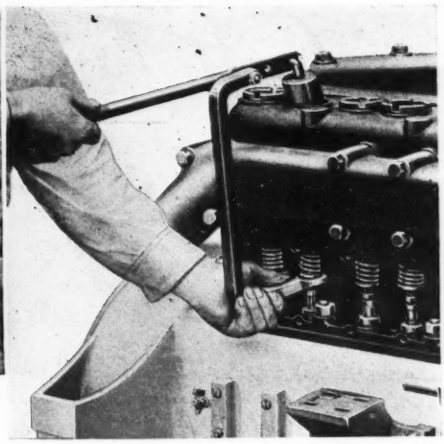
To simplify the removal of valves for inspection or grinding Buda has designed a valve lifter which can be used on all models of Buda engines except the RU. By substituting a smaller block to fit the port hole openings the tool also can be used on that model. The company does not recommend the use of this tool for other than its own product, but it is recommended for every dealer or distributer of trucks or tractors equipped with Buda engines. The tool is substantially made and finished in black enamel. Price, $4.—Buda Co., Harvey, Ill.

Weaver Hoist

The Weaver car hoist is so designed that it can be operated in very cramped quarters. It can be run into position over a car in a crowded shop without more than 12 or 14 in. space on each side of the car. There is practically no work which can be performed by the ordinary block and tackle or crane which cannot be performed to better advantage with the Weaver hoist, it is claimed. When the hoist is not in service it can be run astride of some car in the shop and thus occupy practically no more floor space in the shop than the car itself occupies. Either end of the car can be raised high enough to enable a mechanic to work under it with comfort. The lifting mechanism provides for a leverage of approximately 500 to 1, which will allow the heaviest cars to be raised as desired with very little effort. The frame is designed to permit the height of the arch to be increased about 12 in., allowing the uprights to be raised to the desired height in the braces on either side by the worm hoist. This increased height enables the hoist to raise the rear end of a limousine or touring car with the top up for removing the rear system. Sedan bodies can be lifted off the chassis and placed on supports while the car is being repaired. At normal height the frame is low enough to pass under an ordinary door. One chain of the hoist can be carried over the pulley in the center of the frame for work which can be handled better with a single suspension. The hoist is recommended to lift 3000 lb., but it has



Continental battery stand, which is designed to speed up repairs



Valve lifter for Buda engines

been tested in excess of that weight. It is carried on four ball and roller bearing casters, 5 in. in diameter. The frame is of 5-in. channel steel. The dimensions are from 8 to 9 ft. and weight, 650 lb. Price, $125.—Weaver Mfg. Co., Springfield, Ill.

Cylinder-Reboring Machine

The Moline single-spindle cylinder-reboring machine is suitable for boring either single cylinders or blocks of any kind by sliding them along. The machine is very rigid and is suitable for stationary engine work as well as heavy tractors and the regular motor car sizes. By using a single spindle it is necessary to have only one set of tools for each side of the cylinder, which is made in two different heights of column, 6 ft. and 6 ft. 8 in. The maximum distance from the table to the bottom of head with 6-ft. column is 34 in. Other dimensions are: Travel of table, 21 in.; face of knee to center of spindle, 7½ in.; working face of table, 18 by 41 in.; drive three-step cone pulley, 3½-in. belt, 12, 15 and 18-in. steps; double-friction countershaft with 20-in. pulleys for 6-in. belt; weight, approximately 6520 lb. with the 6-ft. column; spindle nose extending below head, optional in length.—Moline Tool Co., Moline, Ill.

Continental Battery Stand

The Continental battery stand is designed to help speed up work in handling battery repairs. The stand turns easily, as it is on ball bearings, and can be locked in any position. The top is made of one piece of hard wood 1½ by 7 by 10 in., which eliminates the danger of short-circuits and is not affected by acids. Finish is natural wood and black enamel. The device comes complete with screws for attachment to workbench. The shipping weight is 12 lb.—Continental Auto Parts Co., Knightstown, Ind.

The Motorists' Bookman

THE MOTOR TRUCK

"The Motor Truck as an Aid to Business Profits" is the latest book published by the A. W. Shaw Co., Chicago. It is written by S. V. Norton, who, as manager of the truck tire sales department of the B. F. Goodrich Rubber Co., has had many opportunities to study at close range the various problems of truck owners.

Mechanical construction of trucks is considered only insofar as it may have a bearing on maintenance and operating costs. The chapter on truck maintenance was prepared from the experience of Capt. B. B. Lipsner, who was in charge of the 600-truck fleet of the Texas Oil Co. and who is now head of the Aerial Mail Service. Blueprints of his system are given as inserts, showing how the system can be applied to a single truck or a fleet of trucks.

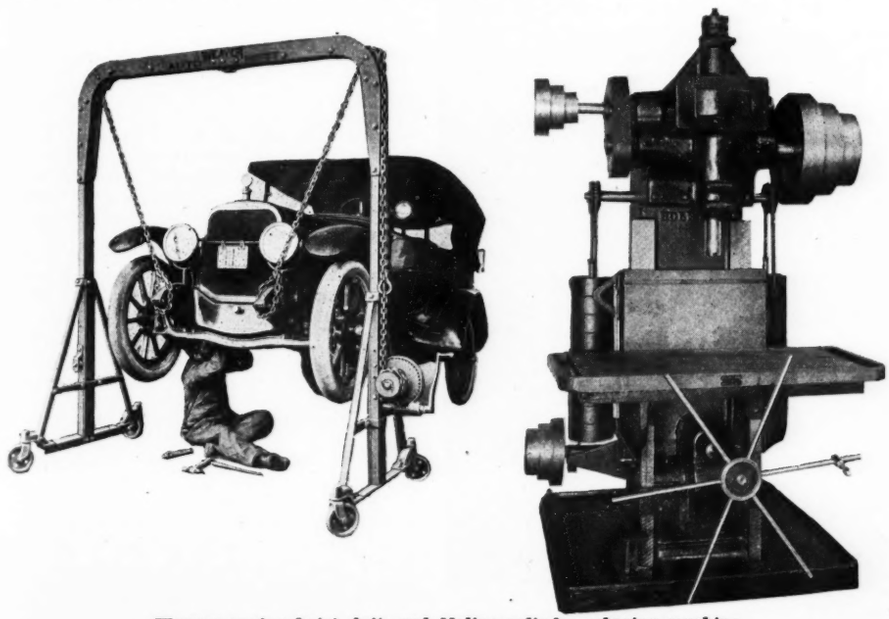
The book tells, among other things, how a Chicago wholesaler saved $8,200 in a year, how an Ohio contractor increased the profits on his motor trucks $18 a day, how a Maine merchant increased his business in the surrounding territory and how another truck owner increased his carrying load 85 per cent, at the same time cutting down delivery costs 33⅓ per cent. The time for installation of a motor truck is considered and methods of estimating the cost of installation and performance are given. Oil consumption, overloading, speed, tires, trailers, special bodies and maintenance that lowers the cost of upkeep are some of the subjects. Price, $7.50; 540 pages, 335 photographs and drawings, charts, folded inserts, blueprints and tables.

INCREASING TIRE MILEAGE

The Firestone Tire & Rubber Co. has brought out a fourth edition of it books on "How to Increase Tire Mileage." This is written for the benefit of car owners and ranges from the first chapter on tire conditions that every owner should know to a twenty-fourth chapter on ineffective repairs. The company maintains a service department for studying conditions, and the book was prepared with a feeling of real interest in the service of car owners. Much valuable information on tires and their care is offered in this small book of sixty-two pages.

VAN BLERCK MOTORS

The Van Blerck Motor Co., New York, has brought out a special edition de luxe of what it is pleased to call its boat book, which is worthy of joining the library of any motor boat enthusiast in view of its artistic handling. More than half of the book of thirty-two pages consists of a gallery of cruisers, runabouts and express cruisers, while the rest of the space is used to describe Van Blerck engines. The edition is limited and copies can be obtained only by request written on stationery of rated firms or by rated individuals, unless accompanied by $1.



Weaver engine hoist, left, and Moline cylinder reboring machine

Among the Makers and Dealers

VICTOR Screw Works Capital Increased—The Victor Screw Works, Detroit, has increased its capital stock from $250,000 to $500,000.

Flanders' Son Joins the Marines—George E. Flanders, eighteen-year-old son of Walter E. Flanders, president of the Maxwell Motor Co., Inc., Detroit, has enlisted as a private in the marines.

Indiana Changes Name and Expands Service—The Indiana Motor Car Co., Chicago, is to be known hereafter as the Automotive Electric Service Corp., and will operate a truck service in Chicago and adjacent towns.

Page Joins Oneida Truck—B. F. Page, formerly eastern representative of the Four Wheel Drive Auto Co., Clintonville, Wis., has been appointed assistant to L. P. Fortin, acting manager of the Oneida Motor Truck Co., Green Bay, Wis.

Change in Willys-Overland Branch—C. B. Derby, assistant sales manager of the Willys-Overland New York branch for several years, has been appointed manager of the branch in Newark, N. J., to succeed Leslie F. Smith, who resigned.

Yule Directs Goodrich War Work—W. H. Yule, head of the mechanical goods department of the B. F. Goodrich Rubber Co., Akron, Ohio, has been placed in direct charge of the company's relations with the Government. He has been in charge of mechanical goods sales for two years and a half, rising to that position from the managership of the Goodrich branch in New York.

New Truck Is Designed—The Universal Motor Truck & Traction Engine Co., St. Louis, Mo., is exhibiting its first completed truck. This is the design of Daniel Timberlake and is to be named after him. It is a four-wheel-drive machine, with short-turning radius, optional location of the engine, steering help from the engine and wheels that are steel or rubber tread. A winding drum for use in loading is another of the unusual features of the new truck. The factory will be located at St. James, Mo. The officers are: President, Edward Bray; vice-president, Richard Shaul, and secretary, W. J. Moore.

Munsa to Manage Thermoid District—George F. Munsa has been appointed district manager of the Chicago branch of the Thermoid Rubber Co.

Briscoe Will Add to Plant—The Briscoe Motor Corp., Jackson, Mich., will erect an additional factory building which will cost approximately $25,000.

Goodyear Now Has 5109 on Honor Roll—The service honor roll of the Goodyear Tire & Rubber Co., Akron, Ohio, shows that up to Aug. 1 in all 5109 of the company's employees had entered Federal service.

Lee Leaves Truck for Army—E. S. Lee, Jr., formerly sales manager of the United States Motor Truck Co. has entered National service as first lieutenant in the Motor Transport Service and is stationed at Camp Holabird, Md.

Ford Gets Injunction on Name—The Ford Motor Co. has been granted a temporary injunction against the Lippow Cycle Co., Milwaukee, Wis., restraining the display and use of a window sign reading "Ford Parts." The complaint was entered by A. W. L. Gilpin, manager of the Milwaukee branch of the Ford company, who testified that the company is not a licensed Ford dealer or agent; that the display of the sign was misleading to the public and also an aid to selling parts not made by the Ford company on representation of such origin.

Decatur Dealers Demonstrate Tractors—Tractor dealers of Decatur, Ill., gave a demonstration of the various makes of machines handled in that territory at the Brett farm, north of the city, and 2500 persons attended. The demonstration was not designed as a competition but to give the farmers an accurate idea of the merits of each, working under the same conditions. Where any farmer requested a special performance of any machine it was granted and he was able to follow closely the work performed.

Cleveland Automatic Tool Enlarges—The Cleveland Automatic Tool Co. has let contracts for a large addition to its plant at Cleveland, Ohio. The company recently acquired the land adjoining its plant. The new structure will be two stories and will cost approximately $100,000.

Remy to Have New Administration Building—A new administration building is being erected by the Remy Electric Co. The general offices of the company have been moved into temporary quarters until the new building, which will occupy the ground where the old Remy administration building stood, is completed.

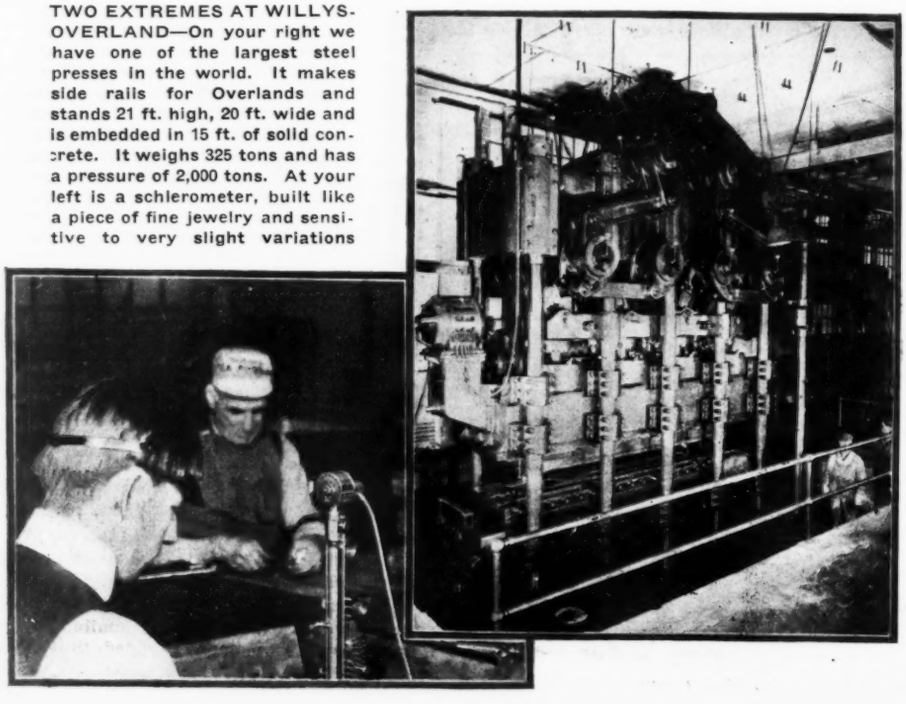
Chicago to Supply St. Louis Fords—W. C. Anderson, manager of the Ford assembly plant at St. Louis, has been transferred to a similar position in Chicago, following the complete transfer of the St. Louis building to the United States as a quartermaster's warehouse. All future Ford deliveries for St. Louis will be made through the Chicago plant.

Brisk Blast Co. Reorganizes—The Brisk Blast Co., formerly of St. Louis, Mo., now located at Monroe, Mich., has been reorganized, J. L. Phelps of St. Louis having disposed of his interests in the company. The new officers are: President, C. B. Southworth; vice-president and treasurer, Charles McIntyre; secretary, J. F. Meyer. This concern manufactures motor car accessories and airplane parts.

Coppock to Direct Lane Production—L. W. Coppock has been appointed general engineer and chief in charge of production of the Lane Motor Truck Co., Kalamazoo, Mich., succeeding Harvey M. Stewart, who recently resigned as engineer of the Lane company. Mr. Coppock was actively interested in the organization of the United Truck Co., Grand Rapids, Mich., and the Higrade Truck Co., Harbor Springs, Mich.

Fornaciari With Midland Car—Bert B. Fornaciari, formerly secretary and general manager of the Harvey Motor Truck Co., Harvey, Ill., has been appointed production manager and chief engineer of the Midland Motor Car & Truck Co., Oklahoma City, Okla. W. B. Burgess, assistant to Mr. Fornaciari at the Harvey plant, also is with the Midland company, as assistant production manager. O. H. Brauer, formerly in the engineering department of the Buda Co. at Harvey, is assistant engineer.

Tractors Swell Sales of Dealers—Tractors and trucks have taken the most prominent positions in the garages at Quincy, Ill., this summer, it is reported. Practically every passenger car distributer has one or more lines of trucks and tractors on his floors and everyone is making a determined drive to get the farmers and merchants interested in their lines. Tractor demonstrations are every-day affairs now. The latest one to be staged was held by the Quincy Overland Co. with the Plowman tractor across the Mississippi river in the Missouri bottoms, where the soil is deep and sticky and the tractor has to work hard to get through. Several different makes of tractors were on hand to take part in the demonstration. The Irwin Motors Co. has taken an agency



TWO EXTREMES AT WILLYS-OVERLAND—On your right we have one of the largest steel presses in the world. It makes side rails for Overlands and stands 21 ft. high, 20 ft. wide and is embedded in 15 ft. of solid concrete. It weighs 325 tons and has a pressure of 2,000 tons. At your left is a schlerometer, built like a piece of fine jewelry and sensitive to very slight variations

for the Heider tractor; the Johnston Plank Co., for the Boring tractor; the Spring Street Garage, the Moline; and Clough Reihm Co., the Case.

Steel Products to Build Power House—The Steel Products Co., Cleveland, Ohio, will build a one-story power house. The structure will be 45 by 70 ft. and will cost approximately $17,000.

McMahan Is Promoted by Remy—George V. McMahan, who was sales manager of the Detroit branch of the Remy Electric Co., has been promoted to be assistant general manager of the Remy Electric factory at Anderson, Ind.

Grant Employees on Annual Picnic—Nearly 600 employees of the Grant Motor Car Corp., Cleveland, Ohio, participated in the first annual outing held at Woodland Park, Ashtabula. Thrift stamps were given as prizes in contests.

Branch Expert Makes Business Pay—Norman H. Halliday, who has built up the New England branch of the International Truck Co., has been sent to Kansas City, Mo., for two months to put the branch in that territory on a paying basis.

Pennsylvania Rubber Declares Quarterly—The Pennsylvania Rubber Co., Jeannette, Pa., has declared its regular quarterly dividend of 1¾ per cent on preferred stock and 1½ per cent on common stock, payable Sept. 30 to stockholders of record Sept. 15.

Miller Rubber to Expand—The Miller Tire & Rubber Co. will take on a contract soon which will make it necessary to employ 400 or 500 additional men and girls. Officials of the company decline to disclose the nature of the contract, but it is assumed that it is a war order.

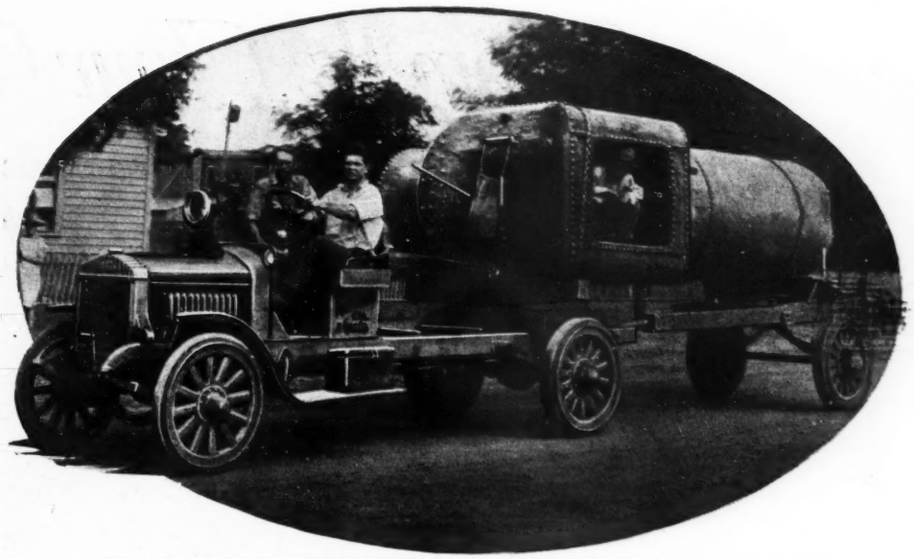
Winkleman Leaves Liberty Car—W. F. Winkleman has resigned as special representative for the Liberty Motor Car Co., Detroit, and is now associated with the Heath-Duplex department of the McCord Mfg. Co., Inc. He has been identified with the industry for the last twelve years.

Goodyear Medical Director to Italy—Dr. Clyde Leeper, medical director of the social service work of the Goodyear Tire & Rubber Co. and in charge of the anti-tuberculosis work of the Red Cross, has been appointed one of the physicians who will have charge of Red Cross anti-tuberculosis work in Italy.

Killing Two Birds on One Trip—When Edward S. Clark, Hartford, Conn., distributer of the Paige, Maxwell and Grant, wants new parts from Long Island City he gets them when he goes to New York for new cars. By this method he kills two birds with one stone, gets his parts in one day and saves express and cartage charges.

McCord Is Expanding Plant—The McCord Mfg. Co., Detroit, is erecting a four-story addition to its plant, three stories to be used for factory purposes and the fourth to be used for offices. The new structure will be approximately 372 by 110, with an area of 134,000 sq. ft., which, added to the present plant, will give a total floor area of 319,000 sq. ft.

Quincy Celebrates New Service Building—In honor of the opening of the new building that will house the sales, service and mechanical departments of the Quincy Overland Co., Quincy, Ill., Manager D. Y. Yantis was the host at a dinner to all the employees of the local branch and guests. A tentative plan was put on foot for an immense celebration to be staged early this fall in this city, to which the several thousand Overland owners would be invited and entertained with tractor demonstrations, picnics and a big barbecue. After the talks were finished, two of the employees who have been called into service and leave next week were presented with service kits by the other employees and given a send-off for their trip to Berlin.



WHEN TRAILER AND TRUCK GET TOGETHER—This outfit is owned by the Frost Ring Oil & Gas Co., Ardmore, Okla. It consists of a 2-ton Master truck with a King 3½-ton pole trailer. The total load of the boiler is 8500 lbs. The company has hauled 10,000 lbs. with the outfit

Warner Gear Adds New Plant—A contract has been let by the Warner Gear Co., Muncie, Ind., for the erection of a large plant to cost approximately $250,000.

Walden-Worcester Opens New Branch—Walden-Worcester, Inc., Worcester, Mass., has opened a branch office in Chicago. The concern manufactures Walden-Worcester wrenches.

Republic Rubber Declares Dividends—The Republic Rubber Co., Youngstown, Ohio, has declared its regular quarterly dividend of 1¾ per cent on first preferred stock, payable Sept. 1 to stockholders of record Aug. 25.

Half Dividends Paid in Liberty Bonds—The C. M. Hall Lamp Co. has declared a 6 per cent dividend on the company's $60,000 of outstanding capital stock, payable Aug. 22, half in cash and half in Liberty bonds.

Smith With Weatherproof Body—L. Clyde Smith has been appointed assistant general manager and treasurer of the Detroit Weatherproof Body Co., Pontiac, Mich. He recently disposed of his interests in the Detroit Welding & Mfg., Detroit electric welder and Burns starter companies.

Davis Now Part of Avery—The Davis Mfg. Co., Milwaukee, Wis., manufacturer of tractor engines, which recently was purchased by the Avery Co., Peoria, Ill., has lost its identity, and from now on the big plant in West Allis will bear the name of the Peoria company exclusively. Frank M. Davis, however, continues as general manager of the unit. The Davis company has been manufacturing engines for Avery tractors and power farm machinery for several years and is now devoted exclusively to that purpose.

Reliance Truck Gets War Order—The Reliance Motor Truck Co., Appleton, Wis., which has just completed and equipped a new manufacturing plant at a cost of $75,000 or more, has taken a Government contract for machine work on large caliber shells. Additional tools and other machinery for this work will be installed immediately. While the contract is being executed the Reliance company will continue to prepare for a large production of commercial cars and internal spur-gear drive rear axles, for which it already has booked contracts to keep the plant busy for months to come. Plans for an additional shop building are being prepared and work will begin before Sept. 1.

Jones to Help Red Cross—A. B. Jones, second vice-president of the B. F. Goodrich Rubber Co., has been appointed director of transportation and distribution of supplies in France for the American Red Cross.

Firestone Entertains Superintendents—H. S. Firestone entertained 400 Firestone superintendents and foremen at his residence at Columbiana, Ohio, recently. Among the guests were Henry Ford and W. M. Mullens of Salem, Ohio.

To Make Mold for Retreading—The Zwebell Bros. Co., Milwaukee, Wis., has been incorporated with a capital stock of $25,000 to engage in the manufacture of a mold for retreading tires and also to conduct a general wholesale and jobbing business in tire repair material and supplies. The Zwebells have been engaged in the motor car sales and repair shop business for many years and recently developed an improved method of dry-cure retreading.

Armstrong Leaves Mitchell for Foundry—William H. Armstrong, for eight years with the Mitchell Motors Co., Racine, Wis., and its predecessor, the Mitchell-Lewis Motor Co., has resigned as secretary and treasurer of the company to take the active management of the Armstrong Foundry Co., Racine, Wis., the recent reorganization of the Holbrook-Armstrong Iron Co. of that city. Mr. Armstrong has been elected president. Mr. Armstrong joined the Mitchell-Lewis interests as a boy and four years ago was elected secretary-treasurer of the motor car concern when the Mitchell and Lewis families disposed of their holdings.

Vesper Will Entertain His Employees—F. W. A. Vesper has notified all employees of the Vesper-Buick Auto Co., St. Louis, Mo., that they shall not make engagements for Labor Day, as on that day each employee and his family is expected to be Mr. Vesper's guest at his farm, Nordam, sixteen miles from St. Louis on the Meramec river. The employees are "expected to supply good appetites and plenty of pep." Notice is given that there are tennis courts, swimming beaches and other means of amusement. Motor cars will call for the family parties. Last year 118 persons attended the Labor Day party.

From the Four Winds

NEW ROAD COMPLETES REMOVAL OF HEAVY GRADES—This is a view of Wauhatchie pike, the completion of which marks the removal of all excessive grades on approach to Chickamauga park. The road is 2¼ miles long and has been dedicated with fitting ceremonies. The steepest grade is only 5 per cent

MADISON to Hold Fall Show—The motor car division of the Madison Association of Commerce, Madison, Wis., has decided to conduct its annual motor show in connection with the Dane County fair at Madison early in September. Emil Hokanson, George Kemler and Porter Gilles have been appointed members of the show committee.

Burlington Way Boosters Will Convene—Plans are under way for the annual convention of the Burlington Way Good Roads Association to be held in Rock Island, Ill., Sept. 27. Delegates are looked for from every city on the Burlington way. The Illinois good roads bond issue will be given especial attention, and various other plans for road improvement discussed.

Places Car's Value at $3 Daily—Being deprived of the use of one's motor car is worth $3 a day. This is the amount fixed by an Iowa judge in a recent decision. J. H. Kofod of Perry, Iowa, brought suit against the city marshal of Perry to recover $10 a day for fourteen days because a motor car belonging to Mrs. Kofod had been held by the marshal. The marshal seized the car on a dispute over a bill. Judge W. W. Kardell awarded the Kofods $3 for their inconvenience in being without the use of the car.

Car Solves Flour Problem—J. E. Plummer, South Paris, Me., has solved the food and flour problem for his neighbors with the aid of his motor car, which he has attached to a flour mill. For years he has worked the mill by hand, and then when age began to creep upon him it was too difficult to turn the machinery. But his neighbors wanted their wheat and rye ground to make their bread, and Mr. Plummer, being the owner of a motor car, decided that he had the power handy if it were hitched to the mill. He secured some gear wheels and with a piece of shafting set the mill up beside his garage, arranging the car so that the shaft would mesh with the end of the crankshaft. He quickly ground up his own stocks and then had the neighbors bring their products along.

Cole Wins Race in Cuba—A Cole Aero eight won the Cuban championship race for standard cars recently on the Oriental Park track at Havana. The race was 30 miles, and the Cole made a time of 29 min. 5 sec., or 61.9 m. p. h. More than 30,000 persons witnessed the contest, which was for a trophy called the Copa Truffin and $2,000 in cash.

Reduced Store Deliveries Have Another Angle—There is another angle to the reduction of store deliveries and that is the effect on the service contractor, the man who sells delivery service to the dry goods houses. One Connecticut contractor who recently completed his own garage and repairshop and sells service involving twenty machines has had to lay off half of them because of delivery reductions. Inasmuch as he had branched out to a considerable extent in the belief in the future and enlarged his fleet in keeping with the store's demands, he feels the blow keenly. The cars for the most part are light delivery vehicles.

Judge Holds Speeders' Court on Lawn—For quick action no town in the state has anything on Berlin, Conn., where the judge holds court on his own front lawn and collects accordingly. Judge G. G. Griswold had a wealthy owner brought before him Thursday evening for speeding. A state policeman who chased the car for a considerable distance testified the speed was better than 60 m.p.h. The judge imposed a fine of $30.

Cross-Country in a Dort—Mr. and Mrs. Harry R. Lewis of San Francisco, Cal., have just completed a transcontinental tour in a three-passenger Dort roadster. They were seventy-four days on the road, traveled 5,339 miles without stopping at a hotel or restaurant and the car was never in a garage from start to finish of the trip. The car was equipped with a complete camping outfit. The motorists report a consumption of 249 gal. of gasoline and 5 gal. of oil.

Des Moines Ford Plant Offered School—The use of the new Ford building at Des Moines, Iowa, has been offered to the public schools. The offer was made by C. L. Herring and was for the period that the building is unoccupied as a motor car plant. Des Moines recently voted bonds for the construction of three new high schools, but the capital issues board has held up the selling of the bonds. The building just completed is six stories, fire proof and could readily be made usable as a school building.

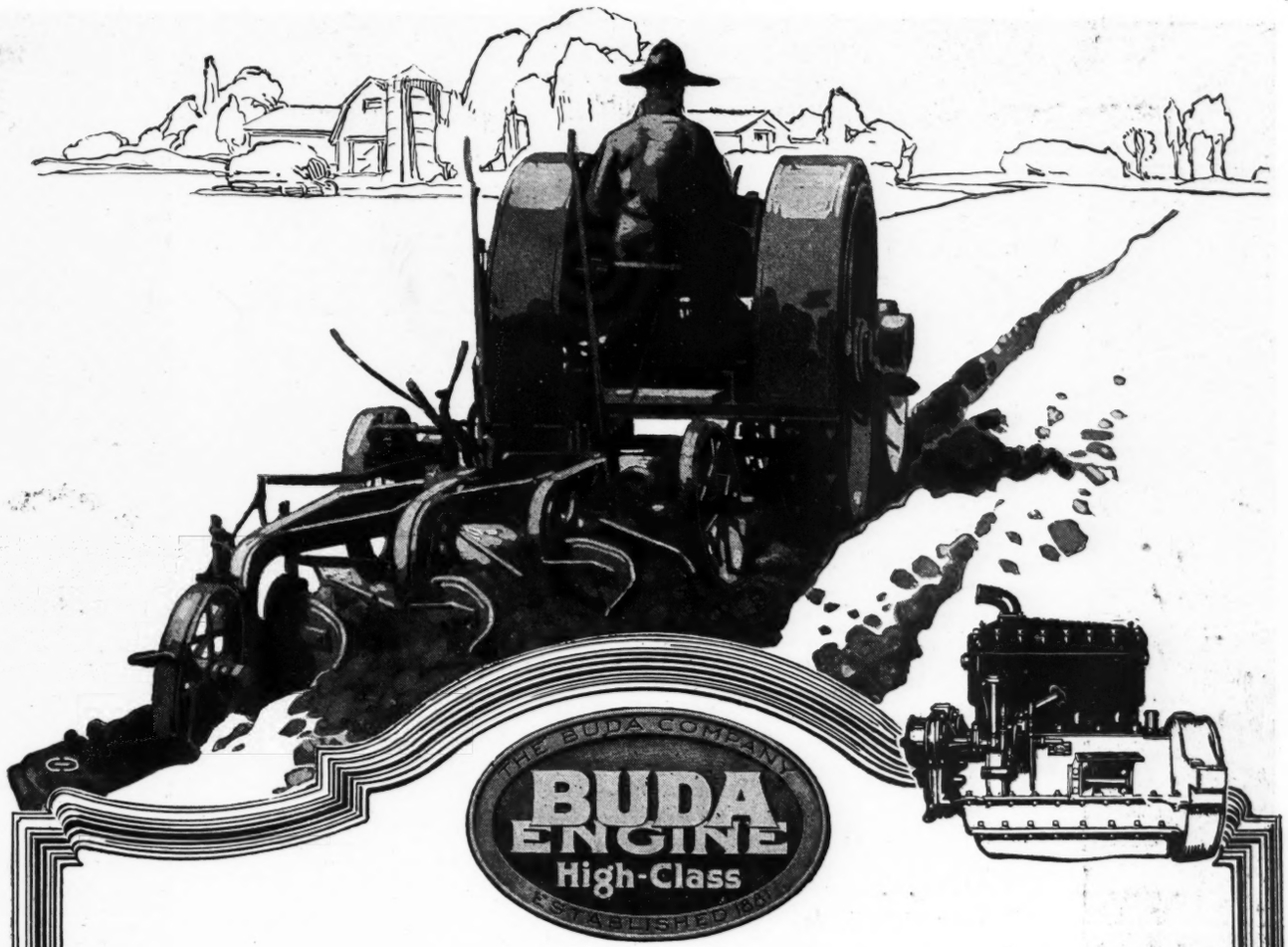
Truck Cuts Cost in Hauling Coal—The Albert Johnson Coal Co., Minneapolis, Minn., has found that a truck pays when it comes to hauling coal. It formerly used three teams at a cost of $335 a month for trucks and drivers. It now uses an Acme truck at a monthly cost of $115.55. With the teams from nine to twelve deliveries were made a day; with the truck, from twelve to fifteen. The amount hauled by the truck was not only more than that with teams but it was hauled at a saving of nearly $8.50 a working day, or $2,633.40 a year.

Factories Hold Field Meet—Large industrial firms with their track and field meets may take the place of the college meets, which have been so drained by the demands of war for men of college age, judging from the recent gathering at Akron, Ohio. Ten large industrial firms of the middle West participated. As a result of the meet plans now are being laid for an Industrial Athletic Association of America, including at least twenty of the country's greatest industrial athletic organizations, which are to compete annually for the industrial championship. The standing of the teams participating in the meet at Akron follows: Firestone Tire & Rubber Co., Akron, Ohio, 21; B. F. Goodrich Co., Akron, Ohio, 20; Western Steel Co., Chicago, 15; Westinghouse Electric Co., Pittsburgh, Pa., 13; Hydraulic Pressed Steel Co., Cleveland, Ohio, 13; American Multigraph Co., Cleveland, Ohio, 5; Pittsburg Seamless Tube Co., 5; Willys-Overland Co., Elyria, Ohio, 3.

Coming Motor Events

SHOWS AND DEMONSTRATIONS

Sept. 2-7—Indianapolis, Ind.
Sept. 5—Medina, N. Y. Tractors.
Sept. 8-14—Milwaukee, Wis.
Sept. 9-15—Madison, Wis.
Sept. 14-21—Chicago, Automotive and Accessories Exposition.
Oct. 14-27—Dallas, Tex.
Oct. 28-Nov. 2—Chicago, N. A. A. J.



Buda Engines Plow the Fields

That the BUDA ENGINE should be selected for so many of the best farm tractors (as well as trucks) is a worthy recognition of its sterling quality.

Farm traction work, especially plowing, is killing to horses, but only the more *economical* of machinery can permanently replace them. Only the highest class of tractor engines can stand the continual strain. This accounts for the pre-eminence which the mighty BUDA has achieved in the field of 1918-19 agriculture.

It is with Pride (as well as Security) that you tell your trade, both for *trucks* and *tractors*—"Yes sir! there *is* a BUDA in it."

THE BUDA COMPANY, HARVEY (Chicago Suburb), ILLINOIS

THE BUDA ENGINE
"HIGH CLASS"

Give Your Customers the Best. The Complete AC Line Meets the Needs of Every Car Made. Its Superiority is Beyond Question

Your best customers are your regular customers. You can best hold their trade by giving them the best merchandise their money can buy.

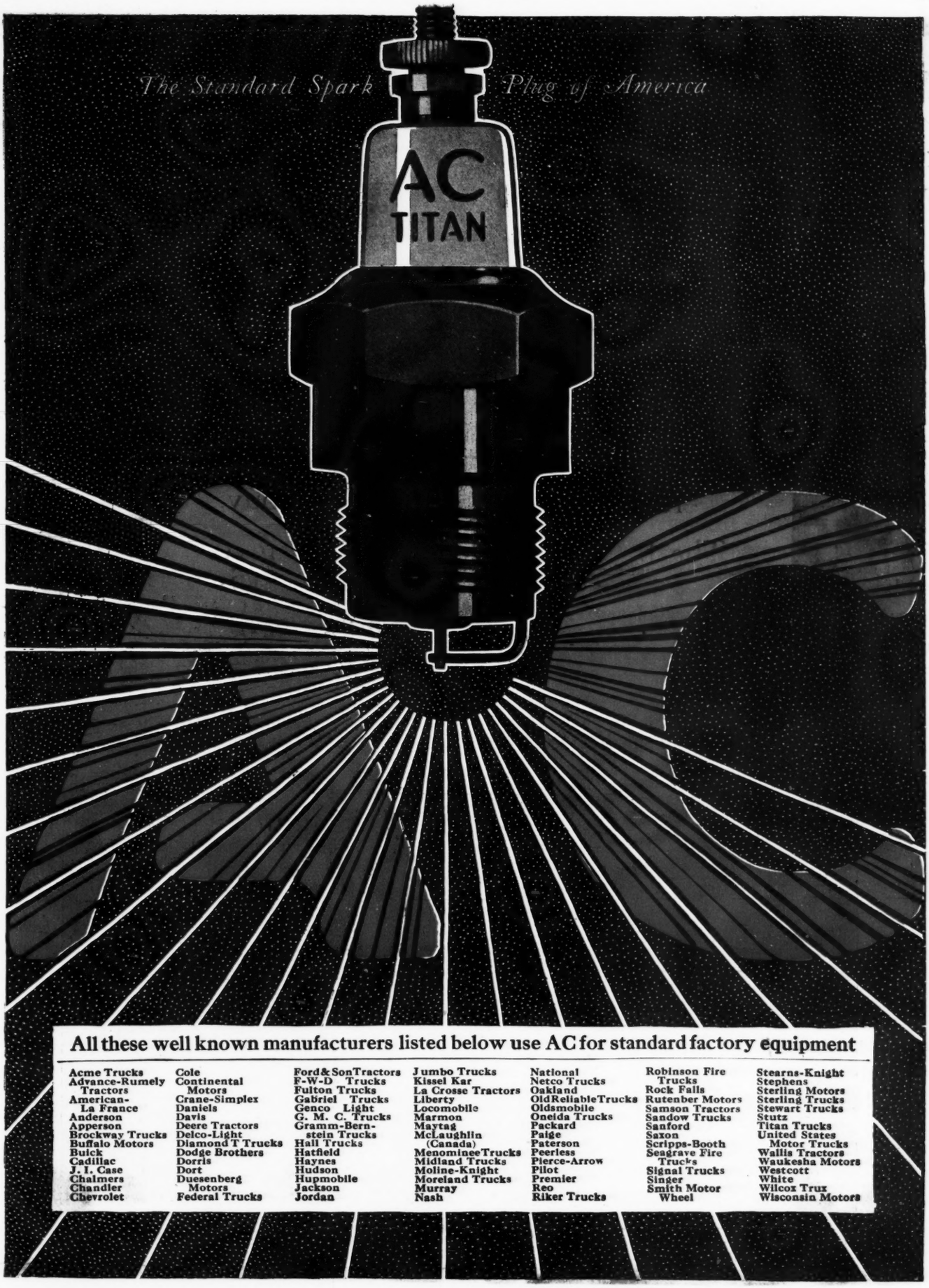
The best spark plugs you can give them are the AC's. That truth is firmly established by the fact that the makers of practically every fine car have for years specified AC Spark Plugs as standard factory equipment.

And owners of every make of car have come to realize AC superiority. They know that the AC line includes plugs specially designed for their motors, no matter what cars they drive.

Concentrate on the AC line. Let your store be known as the AC store. A big national advertising campaign is constantly creating sales for the AC dealer. Line up now with success.

Write for complete dealer information

Champion Ignition Company, FLINT, *Michigan*



All these well known manufacturers listed below use AC for standard factory equipment

Acme Trucks	Cole	Ford & Son Tractors	Jumbo Trucks	National	Robinson Fire Trucks	Stearns-Knight
Advance-Rumely Tractors	Continental Motors	F-W-D Trucks	Kissel Kar	Netco Trucks	Rock Falls	Stephens
American-La France	Crane-Simplex	Fulton Trucks	La Crosse Tractors	Oakland	Rutenber Motors	Sterling Motors
Anderson	Daniels	Gabriel Trucks	Liberty	Old Reliable Trucks	Samson Tractors	Sterling Trucks
Apperson	Davis	Genco Light	Locomobile	Oldsmobile	Sandow Trucks	Stewart Trucks
Brockway Trucks	Deere Tractors	G. M. C. Trucks	Marmon	Oneida Trucks	Sanford	Stutz
Buffalo Motors	Delco-Light	Gramm-Bernstein Trucks	Maytag	Packard	Saxon	Titan Trucks
Buick	Diamond T Trucks	Hall Trucks	McLaughlin (Canada)	Paige	Scripps-Booth	United States Motor Trucks
Cadillac	Dodge Brothers	Hatfield	Menominee Trucks	Paterson	Seagrave Fire Trucks	Wallis Tractors
J. I. Case	Dorris	Haynes	Midland Trucks	Peerless	Signal Trucks	Waukesha Motors
Chalmers	Dort	Hudson	Moline-Knight	Pierce-Arrow	Singer	Westcott
Chandler	Duesenberg Motors	Hupmobile	Moreland Trucks	Pilot	Smith Motor Wheel	White
Chevrolet	Federal Trucks	Jackson	Murray	Premier		Wilcox Trux
		Jordan	Nash	Reo		Wisconsin Motors
				Riker Trucks		

Waltham Automobile Clock

More Than a Quarter Million Now in Use as Standard Equipment

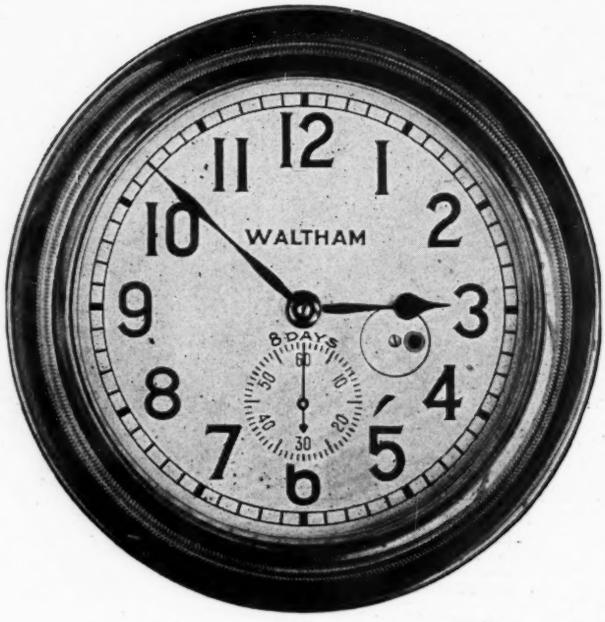
Cars Equipped with the Waltham Automobile Clock

Anderson 6-40	Fergus	Owen-Magnetic
Apperson	Franklin	Packard
Brewster	Haynes	Pierce-Arrow
Cadillac	Hal	Rauch & Lang
Chalmers	Hudson Super-Six	Rolls-Royce
Cole	Jordan	Simplex
Crane	Kissel	Stearns
Cunningham	Locomobile	Studebaker
Detroit-Electric	Marmon	Willys-Overland
Doble	Mercer	Winton
	Murray	

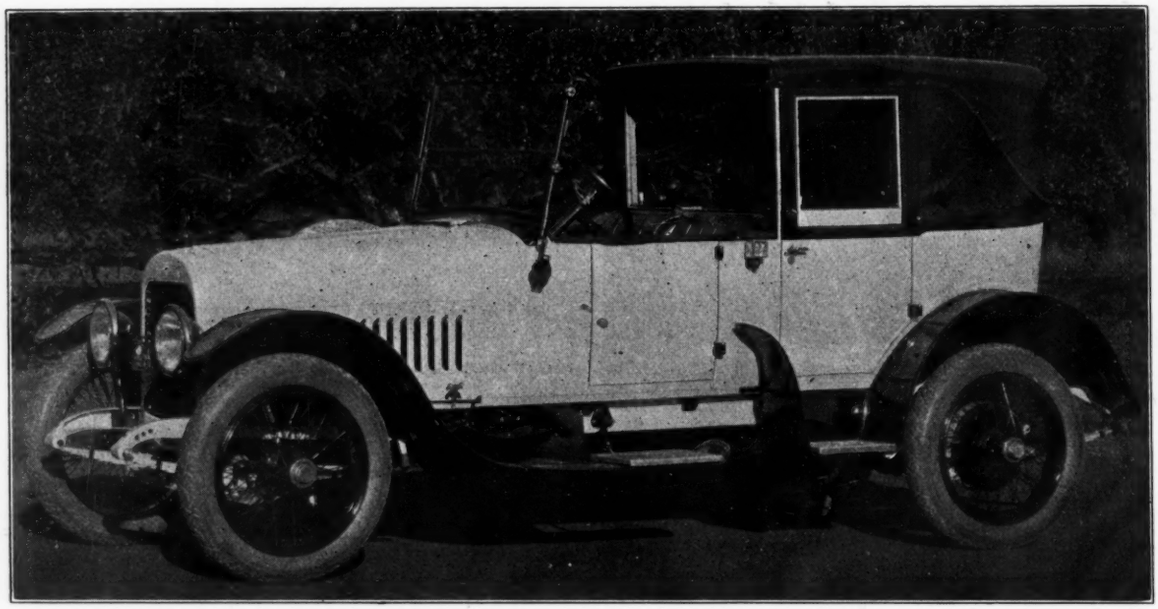
The manufacturers of these cars selected the Waltham because of its unerring time-keeping accuracy under all conditions of temperature and rough riding—

Because of the two mainsprings—the red signal on its dial to tell when winding is needed—

Because no matter how beautiful and luxurious the furnishings of a car, the Waltham Automobile Clock conforms perfectly with them.



WALTHAM WATCH COMPANY, WALTHAM, MASS.



Hudson Full Folding Landau Equipped with the Waltham Automobile Clock

The Best Proposition Yet for the Dealer!

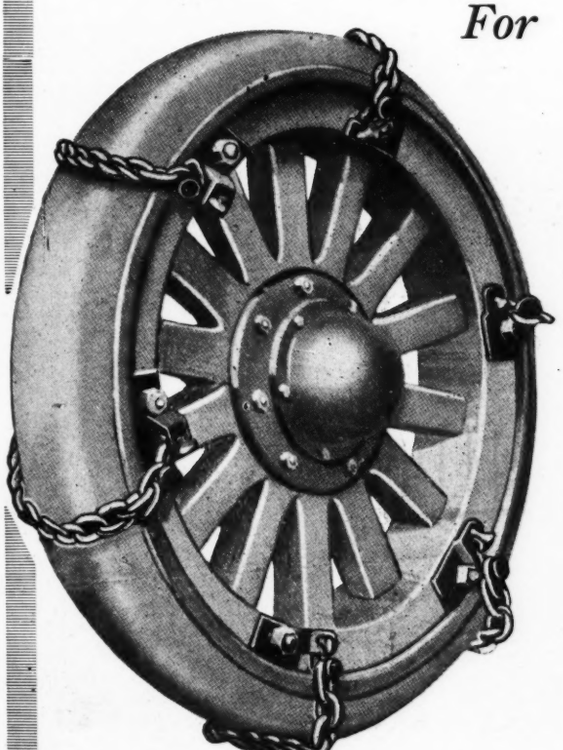
Three sizes of Giant Grip Non-Skid Chains will equip 90% of all trucks made. This means small stock for the dealer to carry. He need not have money tied up in a large assortment of chains.

Every dealer can readily see what this means to him. He can always supply the **right** chain when it is wanted. His customers will appreciate a service of this kind.

"Giant Grips" are the strongest, safest, simplest and most easily attached truck tire chains ever made. Here are some exclusive features that are well worth considering:

GIANT GRIP NON-SKID CHAINS

For Motor Trucks



Uni-Kink, a felloe clamp chain, that solves the problem caused by extended brake drums.

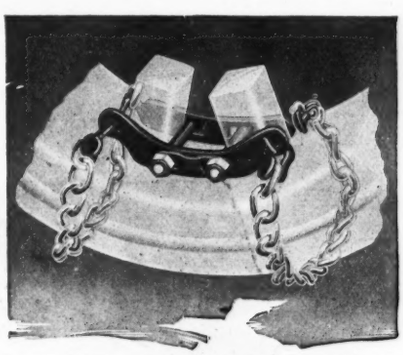
3 SIZES FIT 90% OF ALL TRUCKS MANUFACTURED

1—On or off in two minutes.
2—No tools required.
3—No long, kinky chains to unravel.
4—Attached in deepest mud or snow without use of jack.
5—Economical because carried in tool box when not in use.
6—Chains are adjustable for taking up slack.
7—Instantly accessible.
8—No snap locks to rust tight, fly open or cause trouble.
9—Only entirely heat treated, drop forged chains made.
10—Mechanically perfect.

DEALERS

Our dealer proposition is profitable. It will be to your advantage to write for complete details.

Challoner Company
Oshkosh, Wisconsin
Established 1863



No. 75—Twin-Kink Clamp will fit over one hundred sixty-five makes of trucks equipped with wood wheels having either square, round or oval spokes. For Trucks of 1½-3 ton capacity.

THE LOWEST PRICED 4000 LB. CAPACITY TRUCK IN THE WORLD.

Turn Profits with the "Traffic"

The "Traffic" presents the turning point for profits which dealers have been looking for in selling trucks.

To show a "Traffic" is to sell it—it does not stand in stock as an ornament—it's the sell on sight type and is not in the "once-in-a-while sale" class.

It has met the dealer's desire to furnish the right truck at a price the purchaser is pleased to pay; and today, dealers throughout the country are turning profits with the Traffic.

The Traffic sells and sales count—it is the greatest truck value in the world and has bridged over all competition—proven by its specifications, price and performance.

We are completing one of the best national selling forces ever organized and remaining territory is open to representative dealers. Wire to find out whether your territory is open before asking for details.

Traffic Motor Truck Corporation, 3807-19 Laclede Avenue, St. Louis

NEW TRAFFIC FEATURES: Prompt deliveries; weight, 3,300 lbs.; Gray motor, 4-cylinder valve-in-head, 35 h.p.; Covert transmission; Borg & Beck disc clutch; Kingston magneto; cellular type radiator; drop forged front axle with Timken roller bearings; Russell rear axle; internal gear, roller bearings; semi-elliptic front and rear springs; 6-inch U-channel frame; standard Fisk tires; 133-inch wheelbase; 122-inch length of frame behind driver's seat; oil cup lubricating system—and many other features for perfect performance.

Traffics will be on exhibition, in the truck section, in spaces Nos. 262 and 263, at the Automotive and Accessories Exposition, at the Municipal Pier, Chicago, Sept. 14 to 21

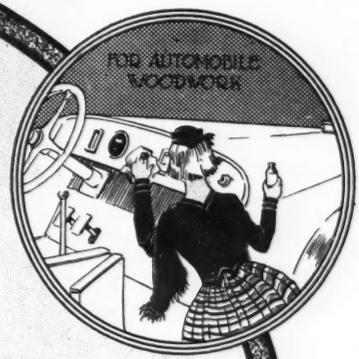
Traffic Truck

4000 LBS. CAPACITY

$1195 $1195

The Many Uses of Waxit

"The SUPREME AUTOMOBILE POLISH"



ABOUT the motor car as well as in the home Waxit is a valuable aid in keeping high finished surfaces brilliantly polished and spotlessly clean.

Using Waxit is not a disagreeable task. There is no odor, no hard rubbing and no inconvenience. Waxit is a liquid,—it is used like soap and water. Merely apply and wipe dry.

Waxit dries quickly leaving a hard, brilliant finish that will not gather dust. It cleans, polishes, prevents checking, removes white water marks and covers up scratches.

Unexcelled for use on leather tops and leather upholstery.

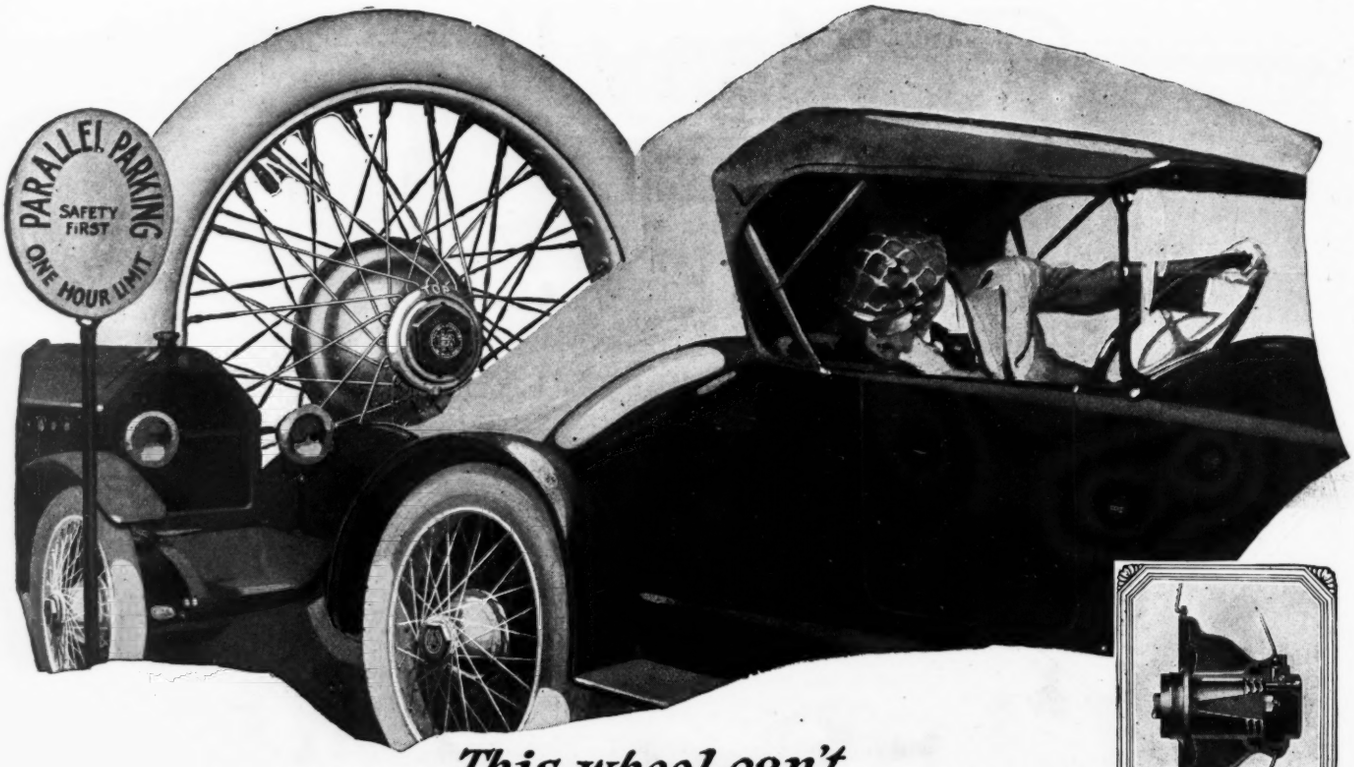
Price 35c to $3.00

DEALERS—Send for a full sized package gratis and the details of our proposition

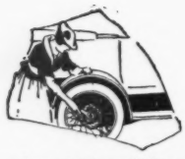
Waxit Manufacturing Company
OLD COLONY BLDG., CHICAGO, U. S. A.

WAXIT Mfg. Co., Old Colony Bldg., Chicago, U. S. A.
I am enclosing 10c for a trial bottle of WAXIT.

Name .....
Address .....
City .....



This wheel can't run off or back off



A quarter-turn of the wrench operates the lock and forces the wheel on or off. The wheel can not stick for all the sliding parts are self-oiled. Takes only six seconds.

Indestructible hub. Super strength is cast into it giving a dependable resistance to tremendous blows. It will bear your closest inspection.

The joy of owning a Kol-Ben equipped car! Fashion has accepted Kol-Ben wire wheels as its standard.

THE KOL-BEN LOCK is a great invention—not merely as a lock in itself, but great in its importance to the motor industry. It has banished that old and deep-rooted bug-bear about wire wheels running off. Motorists can now enjoy the distinctive appearance, convenience, safety and economy of wire wheels—and they need never give one thought to the possibility of the wheel running off or backing off.

Kol-Ben is the double-locked wire wheel. One lock locks the other. It is the motor industry's newest and finest wheel. Its many mechanical features have won immediate approval and endorsement. Not the least important point is the extreme care exercised in the finishing department of the Kol-Ben plant. An elaborate equipment and process, in which costly materials are used, produce a finish not only pleasing but permanent. A special process renders Kol-Ben wheels rust proof before the coats of enamel are applied.

Unusual Opportunity for Jobbers and Dealers

Thousands of wire wheels have been sold, yet the bulk of the demand never has been satisfied. We do not ask jobbers and dealers to place even a trial order until they have investigated the Kol-Ben wire wheel. We claim Kol-Ben the finest wire wheel on the market today—and are anxious to prove it. Write today for additional details of this modern wheel; get the particulars of our proposition. This is a substantial opportunity and back of it is a company well financed and well organized.

KOL-BEN WHEEL COMPANY, INC.
717 LORAINE STREET DETROIT, MICHIGAN

On or off in six seconds, anybody can handle the Kol-Ben wire wheel. There are no lugs or bolts to bother with.

Resiliency. There are 64 spokes in the Kol-Ben wheel, four more than in any other wire wheel of equal size. Greater tire mileage is also a direct result of these extra spokes.

A most elaborate finish is given Kol-Ben wire wheels. Parts are electrically sheradized and several coats of special enamel are applied. Each wheel is baked three times to give long life to the beautiful finish.

KOL-BEN

THE DOUBLE-LOCKED WIRE WHEEL

SRB

MAXIMUM SILENT TYPE ANNULAR BALL BEARINGS

(SINGLE AND DOUBLE ROW)

Whether your requirements demand large or small bearings, our engineering department will help you in selecting the right type of bearing to secure the greatest

SERVICE

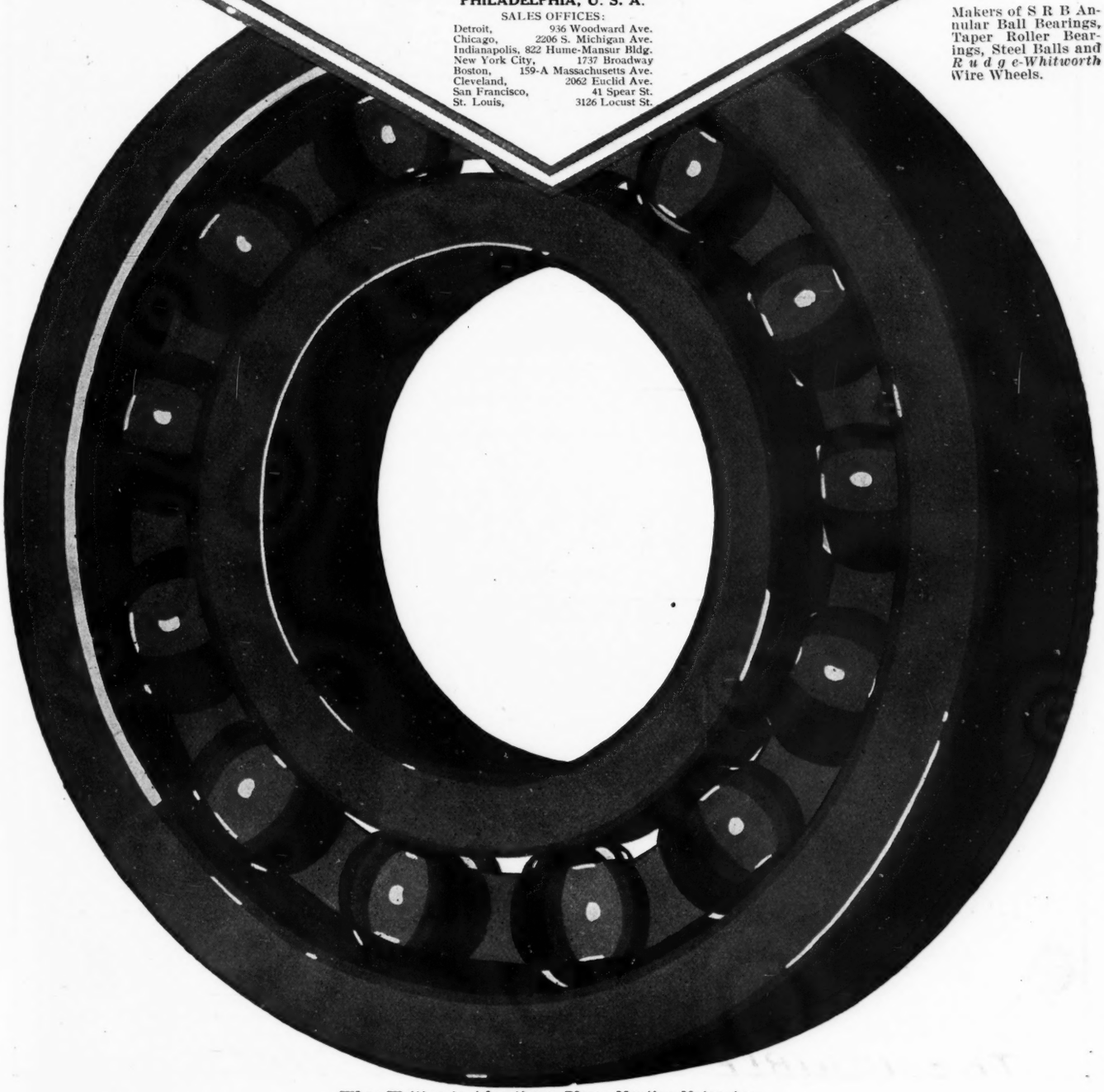
STANDARD ROLLER BEARING CO.

PHILADELPHIA, U. S. A.

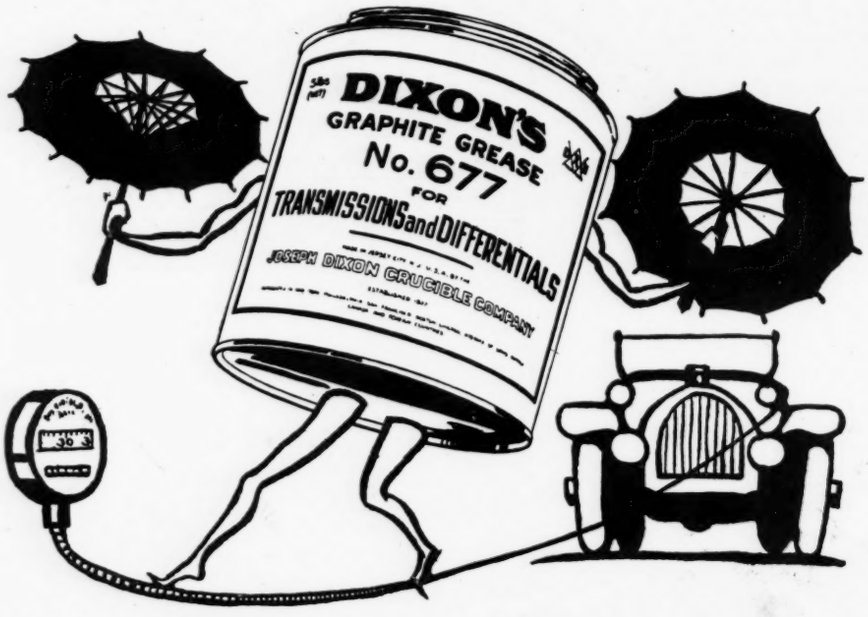
SALES OFFICES:

Detroit, 936 Woodward Ave.
Chicago, 2206 S. Michigan Ave.
Indianapolis, 822 Hume-Mansur Bldg.
New York City, 1737 Broadway
Boston, 159-A Massachusetts Ave.
Cleveland, 2062 Euclid Ave.
San Francisco, 41 Spear St.
St. Louis, 3126 Locust St.

Makers of S R B Annular Ball Bearings, Taper Roller Bearings, Steel Balls and *Rudge-Whitworth* Wire Wheels.



When Writing to Advertisers, Please Mention Motor Age



Run Up Mileage

Getting the most out of your "gas" and the most miles out of your car are the patriotic duties and desires of every American today.

Make mileage figures mount by using the one kind of lubrication that helps your car do its best.

DIXON'S GRAPHITE Automobile LUBRICANTS

"The graphite is the reason"

Specially selected flake graphite that keeps metal surfaces from grinding contact. Dixon's stay longer and work better as a wear preventer than any other lubricant. They make your "gas" go further. The Dixonized car runs smoother—lasts longer. Dixonize regularly and forget about Friction. Write for the Dixon Lubricating Chart No. 82-G.

JOSEPH DIXON CRUCIBLE COMPANY

JERSEY CITY, NEW JERSEY

Established 1827

MARMON 34

Advanced Engineering

Neither snow, nor rain, nor heat, nor gloom of night stays these couriers from the swift completion of their appointed rounds.
—Herodotus.

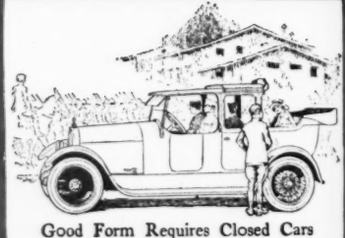
136-Inch Wheelbase
1100 Pounds Lighter

NORDYKE & MARMON COMPANY
Established 1851
INDIANAPOLIS

"Under the new conditions this Closed Car has become a favorite even for touring"

The Woman's Favorite for Attending to her War Duties and for Shopping

The Closed Car Protects Against Wind and Dust as well as Rain



Good Form Requires Closed Cars for Social Activities

MARMON 34

Advanced Engineering

The Year-'Round Utility of Marmon Closed Cars

AMERICA'S economic needs have gained wide recognition among motorists for the Marmon 4-door Family Sedans, Town Cars, Limousines, and Landaulets.

This is largely because they serve all uses in all seasons, and because they save from 40 to 50 per cent in tires and 50 to 75 per cent in fuel.

The superior quality of the Closed Car is strikingly recognized by the commissioned officers of the Allied Armies in France and Flanders. Closed Cars are in general use the year around "over there" because they protect the passengers in every kind of weather.

Marmon bodies have an exclusive nobility of line that would not be possible on a conventional chassis of old style design. They are long and low in fact as well as in appearance.

The seats are wide, the interior roomy, yet the over-all height is only 79½ inches from the ground.

Because it is built on the most advanced principles—and correct ones—the Marmon design is stabilized. This means that aside from natural wear these superb motor coaches are good for many years.

Moreover, all Marmon Closed Cars are lighter than even open cars of comparable size and power.

136-Inch Wheelbase—1100 Pounds Lighter

NORDYKE & MARMON CO.
Established 1851 : INDIANAPOLIS

MARMON

QUICK-UNFAILING RECOIL

WITH ALL THE KICK LEFT OUT

HIGGINS

QUALITY SPRINGS FOR REPLACEMENT

"Win the War First"—everything else is of secondary importance now—the life of the Nation is at stake. If it is *lost—everything* is lost.

Save! Conserve! *And Serve.* Do your bit—*and some.* That's our spirit—War First—*Win First.* And that's the spirit you'll find in Higgins Quality Springs. A clean fight to the finish—quality that doesn't know the meaning of defeat—that absolutely *refuses* to surrender to the most brutal attacks of bumpy travel.

The sort of spring service you need to protect your car—to conserve costs—and to render most efficient service in a military, purely patriotic or industrial way.

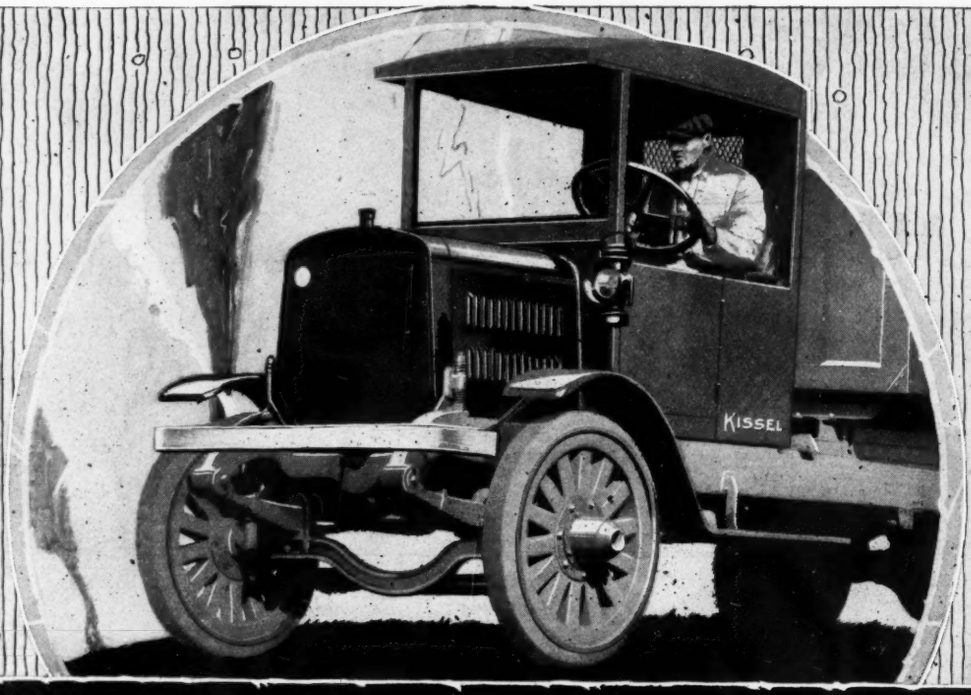
With us—it is Government demands above everything else—consequently, we make no unpatriotic or untruthful delivery promises. We are serving the Nation to the full extent of our ability. We will serve *you* as quickly as conditions will permit. And—this you may be sure of—the Springs you *do* get will rank up to your demands—no center bolt—no center breakage—or breakage in any section.

If your Dealer refuses to supply you, write us.

DEALERS—who are particularly interested in after-the-war trade development—write for catalog listing 500 different styles of springs and Selling Helps.

HIGGINS SPRING & AXLE CO.
DEPT. 821 RACINE, WISCONSIN

NO HOLE-NO BOLT-NO HUMP-NO JOLT



KISSEL TRUCKS

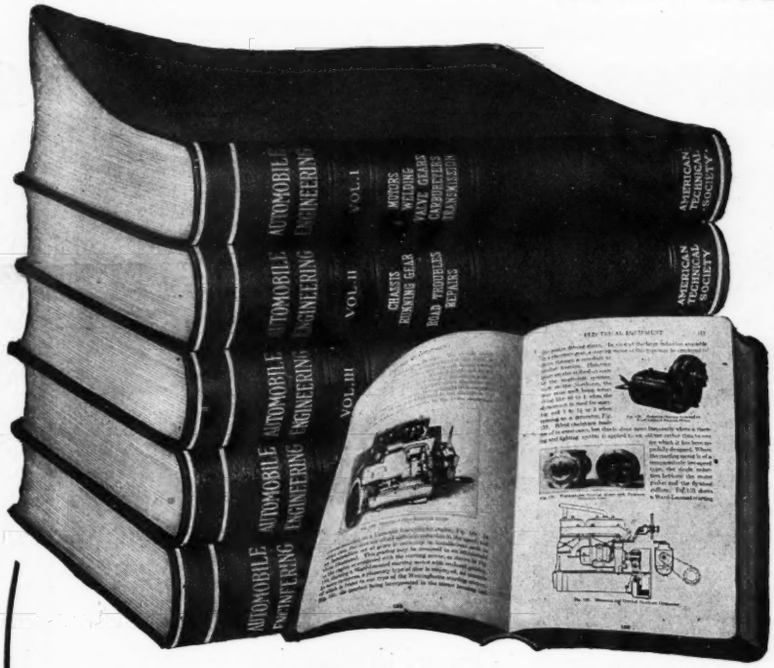
STRENGTH in abundance for continuous service—unlimited power for uninterrupted performance—quality materials that insure long life and economical upkeep.

The efficiency of Kissel Trucks in solving Industrial America's Wartime Transportation Problems is due to Kissel's 10 years' experience of motor truck designing and construction.

There is a Kissel Truck built in the right size for your business. See nearest Kissel dealer for specifications and prices.

DEALERS — The reputation of Kissel Trucks among your customers is unquestioned. Correspondence invited.

KISSEL MOTOR CAR CO., Hartford, Wis., U. S. A.



New 1918 Edition

A revised and enlarged edition of our well-known **Library of Automobile Engineering** is just off the press. This up-to-the-minute work answers fully 10,000 questions on the repairing of all types of pleasure and commercial cars. No car owner, chauffeur, garage owner or repairman can afford to be without it. Sign and mail the coupon! It will bring you a complete set for seven days' examination and actual use. If the books fail to please, return them at our expense. If you decide to buy, pay the low introductory price at the rate of **50c a week.**

Mr. L. P. Coester, Philadelphia, Pa., writes: "When I first got your books I was earning $18.00 a week as a repairman. Now I am paid a salary of $30.00 weekly, and make considerable extra money in my spare time."

Mr. M. C. Armel, Royston, Ga., says: "Since reading your books my salary has been increased $40.00 a month. I am now a garage foreman with seven men under me."

Automobile Engineering—1918 Edition

The 1918 edition of the **Library of Automobile Engineering** is the newest and most complete work of its kind obtainable. Practically every type of pleasure and commercial car is described and illustrated, including 1918 models. Two entire volumes are devoted to the various ignition, starting and lighting systems, and hundreds of new wiring diagrams have been added. Welding, vulcanizing and public garage operation are thoroughly covered. Five thick volumes, 5¾ by 8¼ inches, flexibly bound in genuine morocco leather, gold stamped; 2,500 pages, 2,100 ilustrations, wiring diagrams, etc., that make difficult points as simple as A-B-C. Written in plain, every-day language. Concise and to the point. Carefully cross indexed for quick reference.

Sent for Seven Days' Trial—50c a Week If You Buy!

Don't send a penny. Just put your name and address in the coupon and we'll send all five volumes to you. Pay only the small shipping charge when they arrive. Read them—study them—use them as if they were your own for an entire week. If you don't like them after 7 days—send them back at our expense. If you keep them, send only $2.00 within 7 days, and then $2.00 a month—**50c a week**—until the introductory price of $17.80 has been paid. The regular price of this set will be $25.00.

What the Books Cover

Explosion Motors, Welding, Motor Construction and Repair, Carbureters and Settings, Valves, Cooling, Lubrication, Fly-Wheels, Clutch, Transmission, Final Drive, Steering, Frames, Tires, Vulcanizing, Ignition, Starting and Lighting Systems, Wiring Diagrams, Shop Kinks, Public Garage Design, Equipment and Operation, Electrics, Storage Batteries, Care and Repair, Steam Cars, Motorcycles, Commercial Trucks, Glossary.

A Year's Consulting Service FREE

With each set we give you, absolutely free, a year's Consulting Membership. The regular price is $12.00, but you get it free with the set. Put your perplexing problems up to a staff of automobile experts. Ask them as many motor questions as you wish for a whole year free! A Chicago garage man writes: "This service alone is worth more than the cost of the books."

Mail the Coupon

Don't Send Us a Single Penny

Your name and address on the coupon brings the five books to you, shipping charges collect, for seven days' trial, returnable at our expense if they fail to please. This offer is open to every person within the boundaries of the United States and Canada. Act quickly before rising paper costs compel an increase in price. Send coupon today—NOW.

AMERICAN TECHNICAL SOCIETY Dept. A190-C, CHICAGO, U.S.A.

AMERICAN TECHNICAL SOCIETY,
Dept. A190-C, Chicago, Ill.

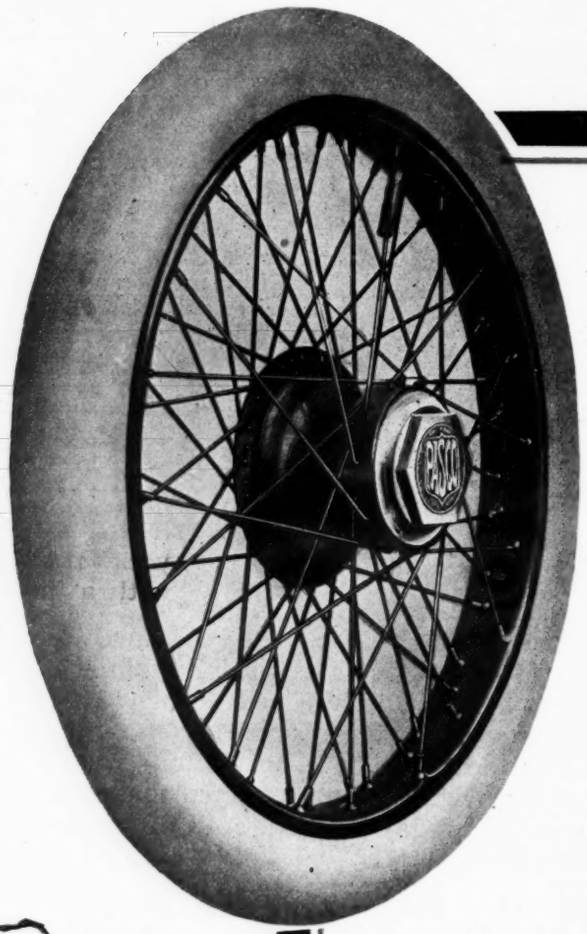
Please send me the 5 volume Automobile Engineering (1918 Edition) for 7 days' examination, shipping charges collect. If I decide to buy, I will send $2.00 within 7 days and $2.00 a month thereafter until $17.80 has been paid. Then you will send me a receipt showing that the $25.00 set of books and the $12.00 Consulting Membership are mine and fully paid for. If I think that I can get along without the books after seven days' trial, I will return them at your expense.

Name .....

Address .....

Reference .....

Each Spoke Crosses 4 Other Spokes



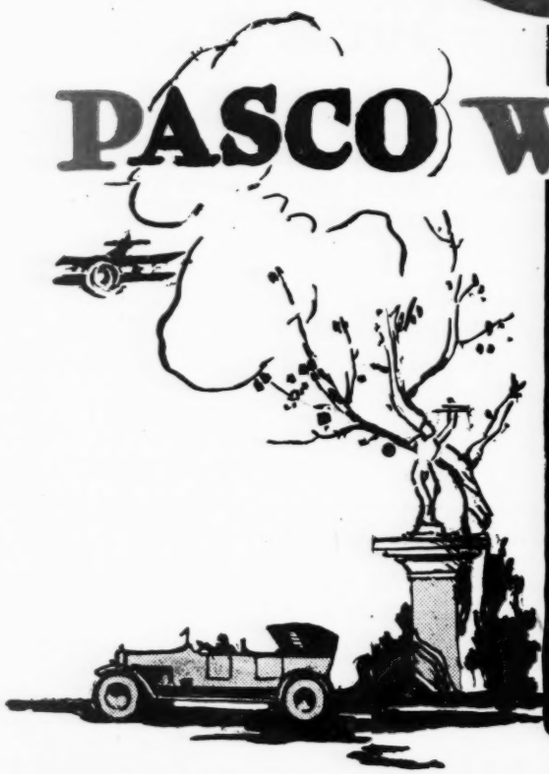
Stronger—Safer More Enduring

The Pasco Wire Wheel has definite points of superiority—points that are more than glittering generalities.

One of these points is the Pasco method of rim-punching and spoke lacing, forming a 4-ply wire web. That is, each spoke on both sides of the wheel crosses 4 other spokes on its way from hub to rim.

Actual tests have proved this construction to be far stronger than the ordinary wire wheel and 5 times as strong as a wood wheel. This is a Pasco Feature.

PASCO WIRE WHEELS



The tremendous strength and dependability of the Pasco Wheel and its added factor of safety are also partly due to the indestructible hub cap and patented locking device that makes loose or wobbly wheels impossible. The Pasco Wheel cannot come off, except by means of the Pasco Wrench.

The simplicity of construction, accessibility of parts and lightning "quick-change" features of the Pasco speak for themselves. Its Beauty, Economy and Long Life under hard service are the usual accompaniments of Quality.

Pasco Wheels are in use on practically every type of Airplane—a strong recommendation of their efficiency.

DEALERS: Write for unusual selling proposition. It will interest you.

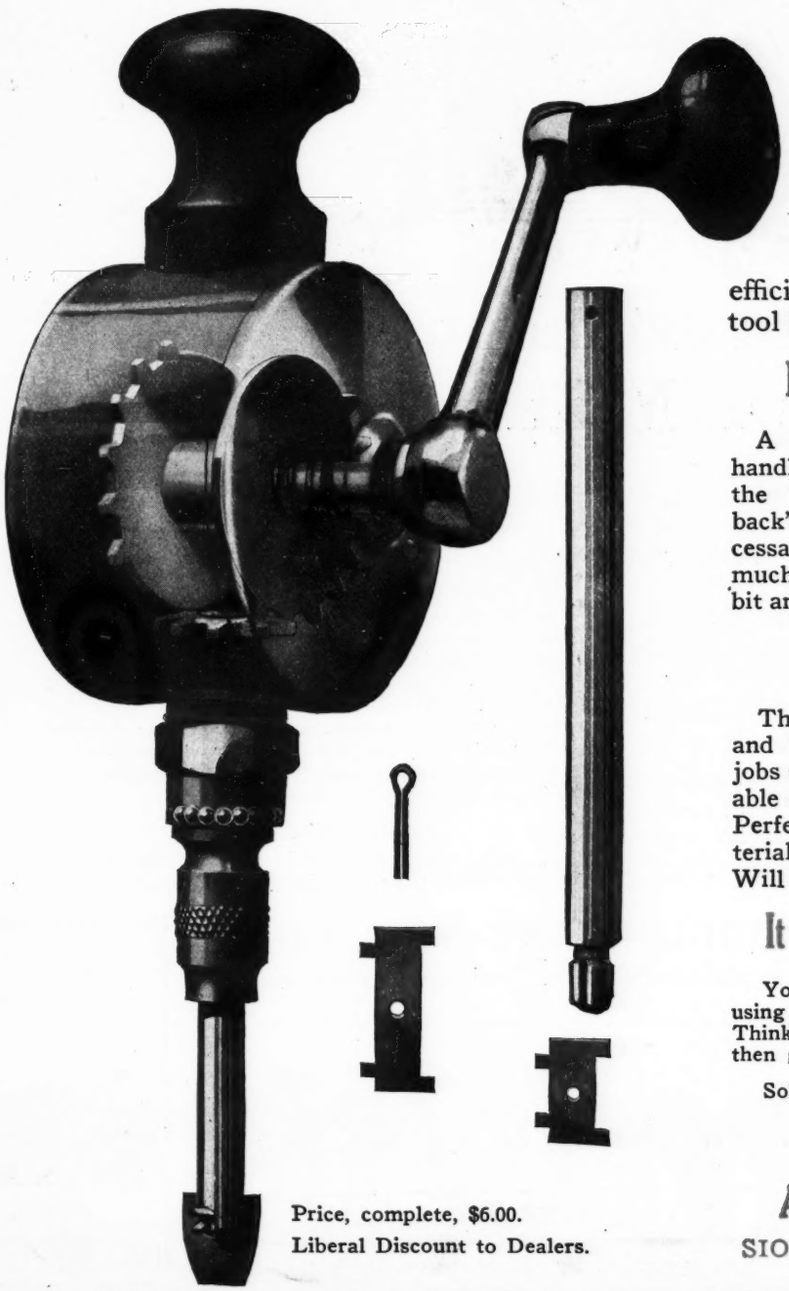
National Wire Wheel Works, Inc.

Geneva, N. Y. **U. S. A.**

PASCO

THE SIOUX VALVE GRINDER

Every Mechanic Needs One



Price, complete, $6.00.
Liberal Discount to Dealers.

Have one for your very own—keep it where you can always find it when you need it. Don't depend on one tool for the whole shop—don't waste your time trying to work with a makeshift outfit. Get one of these strong, efficient grinders for your own tool kit.

New Principle Saves Labor

A continuous movement of the handle in one direction gives the valve the reciprocating or "forward and back" motion, which is absolutely necessary for perfect valve grinding, much faster and easier than the old bit and brace or screwdriver method.

Ball Bearing Throughout

This feature insures easiest action and least wear on bearings — makes jobs short and easy. Five interchangeable driving points—will fit any valve. Perfect balance and perfect stroke. Materials and workmanship of the best. Will last a lifetime.

It will Pay You to Investigate

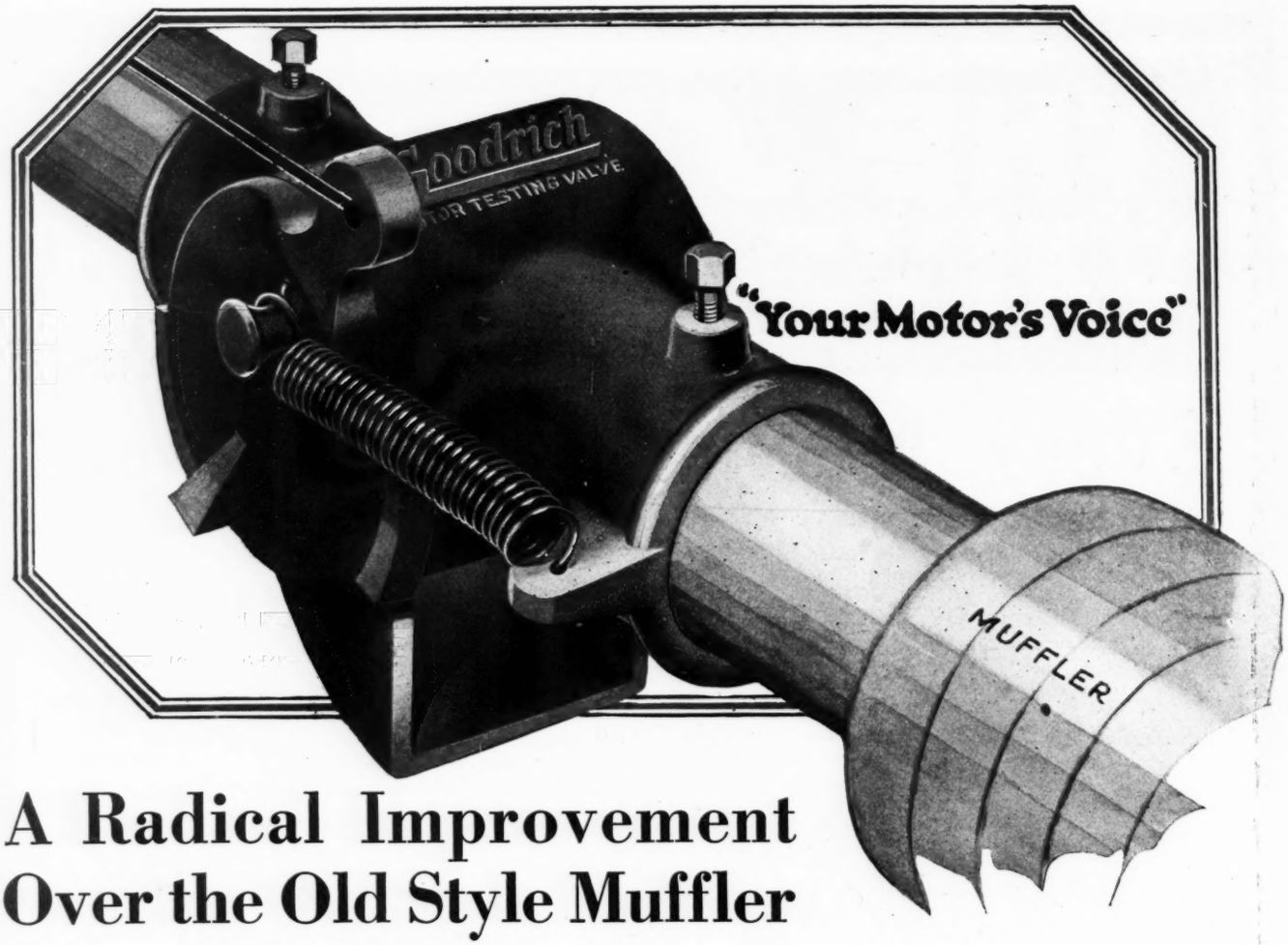
You are wasting your time, if you are not using the most efficient tools you can buy. Think how much you need this grinder—then go and examine one—today.

Sold by all live jobbers.

Manufactured by

Albertson & Company

SIOUX CITY - - IOWA



A Radical Improvement Over the Old Style Muffler Cut-out Devices

Just consider the following facts and judge for yourself.

The GOODRICH MOTOR TESTING VALVE remains in good condition as long as your car.

Its operation is quick, sure and positive—always.

The sharp edge of its revolving shutter prevents the formation of carbon and entirely obviates any "sticking" or sluggish action.

Its bell-shaped mouth produces a loud, clear, sharp note, easily heard above all conflicting noises.

Its full-sized opening and direct channel assures you an instant and entire relief from back-pressure.

Its mechanical construction is simple, containing but one moving part. It is both indestructible and trouble-proof.

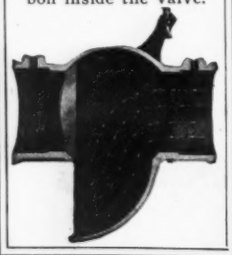
In design it is a distinct improvement over old-style cut-outs. No adjustments are ever necessary.

It is guaranteed for the life of the car against defects in material or workmanship.

A SIZE FOR EVERY CAR

Wise Dealers Already Have Full Details! Have You? If not write at once to

A bisected valve—showing closed position. Note the knife edge of the revolving shutter. It prevents the formation of carbon inside the valve.



GOODRICH-LENHART MFG. CO.

419 WIDENER BUILDING PHILADELPHIA, PA.

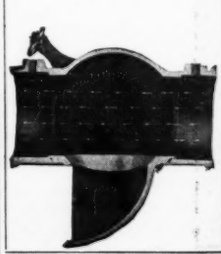
Member of National Association of Automobile Accessory Jobbers

Goodrich

MOTOR TESTING VALVE

(replacing old style cutout)

Open Position. The bell-shaped mouth intensifies sound and relieves the engine of all back pressure.



Why the Lalley-Light Agency Appeals to Automobile Dealers

Every broad-minded business man knows that there are three fundamental, necessary principles that must be present to make it possible for a business to succeed, if properly managed:—

First—Is there a market for the product intended to be manufactured?

Second—Will the product do, with proper satisfaction, what it is intended to do?

Third—Is the selling price satisfactory, and does it permit of a lucrative return to those who handle the product in a businesslike way?

The Lalley-Light agency answers all three of these requirements, because:

First—There are over seven million farmers (a huge number of whom are immediate prospects), in the United States, more prosperous today than ever in the country's history, demanding labor-saving and efficient producing equipment on their farms.

Second—More than eight years of highly satisfactory service is the brief story of the Lalley-Light product.

Third—The selling price is low and well within the reach of several million farmers and at the same time the distributors' and dealers' discounts make it every bit as attractive as the automobile manufacturers' discounts.

The competition is most limited, leaving this enormous field in a most healthy condition to enable the dealer in Lalley-Light to avail himself, in a practical, money-making way, of the advantages of this agency.

Lalley Electro-Lighting Corporation

W. A. Lalley

President

LALLEY-LIGHT

THE ELECTRIC LIGHT AND POWER FOR EVERY FARM

Save Tube Trouble —and Tube Money

The average cost of repairing a punctured tube with PERMA-LOC is 1 1/5 cents, plus the two minutes it takes you to do it.

The cost of a new tube is several dollars.

A punctured tube repaired with a PERMA-LOC 3-ply patch is as good—as sound and whole—as before the puncture occurred. This is equally true of a blow-out!

Therefore, if it were nothing else, it would be *economy* to have PERMA-LOC—always—in your tool kit or side door pocket.

But it is more than an economy. It's a time saver; positive insurance against trouble and delay. You can cut off a strip of PERMA-LOC the size of the puncture, apply it to the damaged tube, and have the tube ready for *immediate use in two minutes' time.* The patch will not creep or loosen. It is self-vulcanizing and is guaranteed to hold permanently.

PERMA-LOC patching material comes in a long, wide sheet. You cut your patch to fit the puncture—the sensible, economical way. Punctures and blow-outs up to 17 inches in length permanently repaired.

Safeguard yourself against possible delay, annoyance and needless expense—carry a PERMA-LOC kit in the car with you always.

At your dealers or direct—

Three size kits to choose from, 50c., $1.00, $1.50, contained in a stout metal case, together with necessary tube of cement.

Perma-Loc Mfg. Co.

310 Board of Trade Building

Scranton, Penna.

Factory: Wilkes-Barre, Pa.

Perma-Loc

The Original 3-Ply Patch

Dealers *Every man or woman who owns a car is essentially interested in what PERMA-LOC will do. You'll find it easy to sell. Every claim backed by a positive guarantee. Write for discounts and full particulars.*

This Sample Size Kit, enough patching material and cement to repair 12 average tube punctures, will be mailed, anywhere, upon receipt of 24 cents in stamps to cover the cost of postage, shipping and containers.

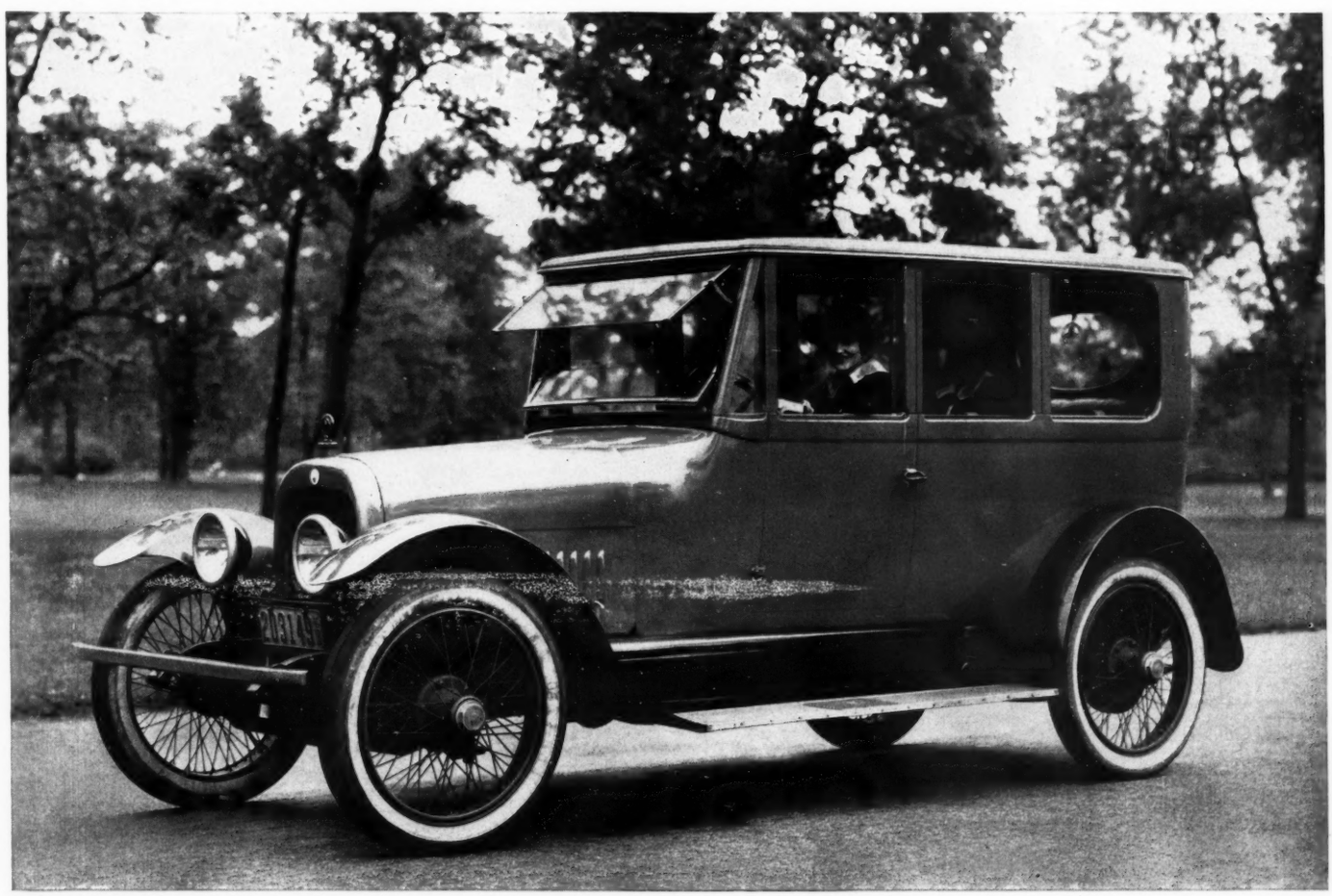
JORDAN

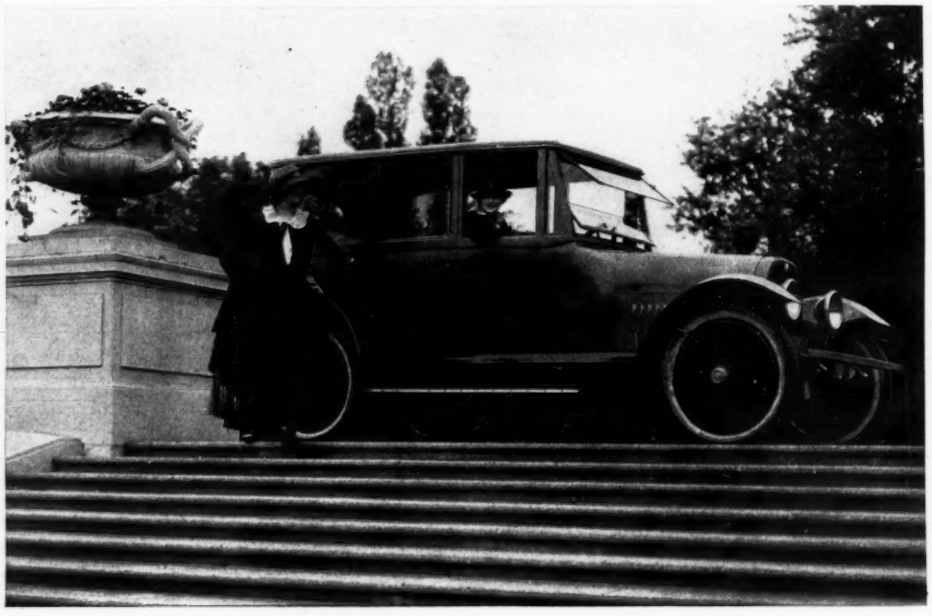
The Aluminum Sedan

THOSE who prefer an enclosed car for family use all year around have learned by experience that quality and service in the Sedan type depend upon the character of workmanship in the body, the weight, and the manner in which the body is balanced on the chassis.

The Jordan Sedan body is all aluminum, fashioned by workmen who have been trained for years in the design of the finest custom made bodies.

It is extremely light and perfectly balanced with the result that the Jordan Sedan weighs only two hundred pounds more than the open touring model.





The Family Car for all Seasons

THE body is distinguished by a method of construction which makes it essentially rattle-proof, and the top is specially constructed to deaden sound. It is finished in two optional colors, Liberty blue and Venetian green, with the upper portion in Stygian black. The upholstery is of that quality which characterizes only the very high priced enclosed models.

The capacity is seven passenger, yet the body is of the straight line type.

The forward portion is enclosed by a three-part, rain-proof front, with upper and lower sections ventilating. The front and center windows disappear entirely, while the rear quarter may be dropped or can be removed.

Marshall cushion springs are used throughout, and there are silk roller curtains on rear quarters and rear. There are Yale locks on the doors, and the equipment includes rim-wind and rim-set clock on the dash, traffic bumper, and Macbeth lenses. The rear seat is forty-six inches wide and twenty inches deep.

The Jordan Sedan is essentially an enclosed car which possesses the characteristics of the convertible, without the objectionable details of the ordinary type.

JORDAN MOTOR CAR COMPANY

CLEVELAND OHIO

30 minutes after you start using them

Give more power
Save gasoline
Save oil
Stop plugs fouling
Stop engine smoking

Within thirty minutes after you start your engine these rings will prove themselves to be an extremely profitable investment.

The minute oil grooves make it possible for these rings to seat themselves perfectly—almost instantly. The patent peening prevents waste of power by holding them to their tension against the cylinder walls even though the cylinders be worn out-of-true, and the wonderful "Always Tight" Expansion Joint compensates for any wear which may occur in the rings, keeping them permanently gastight.

Munger "Always Tight" Piston Rings are the easiest of all piston rings to install. Slip them over the Munger Ring Insertion Tool, which comes with each complete outfit, and they slide into their grooves without breakage or trouble of any kind.

A signed guarantee that these rings will do all we promise accompanies each complete outfit. If the rings do not give you entire satisfaction, return them at any time within thirty days to the dealer from whom you bought them, and he will give you your money back.

SPLITDORF ELECTRICAL CO., Newark, N. J.

Splitdorf Branch Houses and Service Stations:

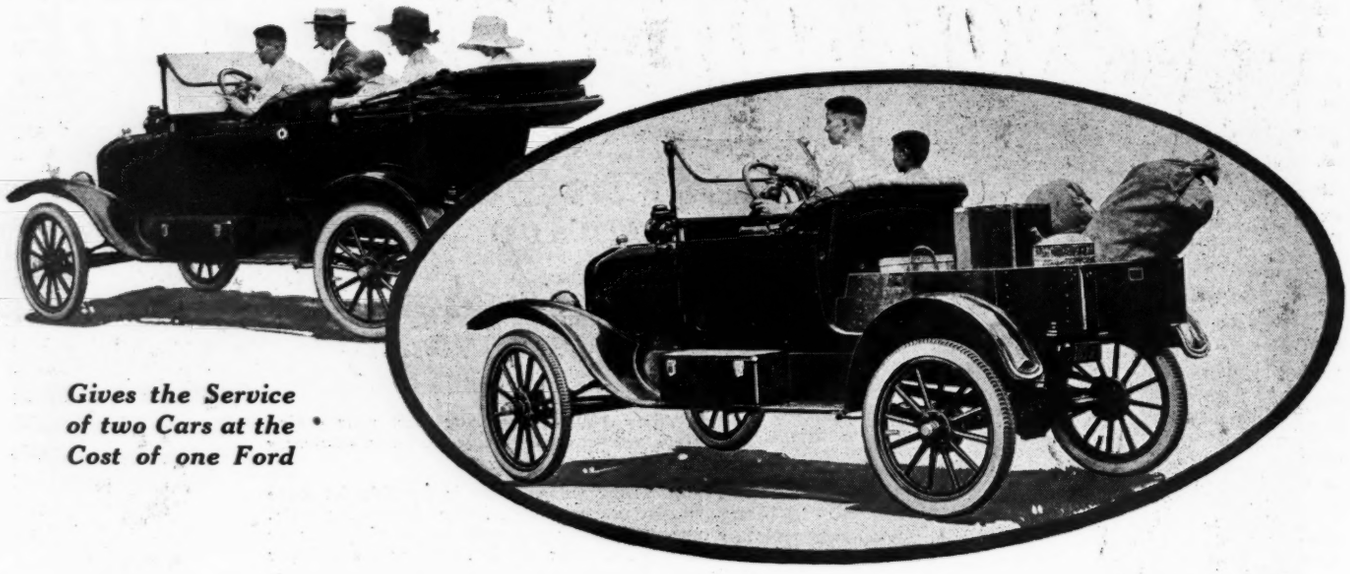
Atlanta,	10-12 E. Harris St.	Minneapolis,	816 Hennepin Ave.
Boston,	68 Brookline Ave.	Newark,	278 Halsey St.
Chicago,	2613 S. Michigan Ave.	New York,	7 W. 61st St.
Dallas,	402 S. Ervay St.	Philadelphia,	210 N. 13th St.
Detroit,	1295 Woodward Ave.	Pittsburgh,	5943 Ellsworth Ave.
Kansas City,	1827 Grand Ave.	San Francisco,	1022 Geary St.
Los Angeles,	1215 S. Hope St.	Seattle,	1628 Broadway
		Toronto,	469 Yonge St.

The MUNGER "Always Tight" PISTON RING OUTFIT—

8 Regular Size Rings
4 Over-width Rings
1 Regrooving Tool
1 Ring Insertion Tool

MUNGER "Always Tight" Piston Rings

A Million Live Prospects for Heath DUPLEX



Gives the Service of two Cars at the Cost of one Ford

The Heath DUPLEX folding delivery body makes a Ford do the work of both truck and passenger car.

It is estimated that at least a million owners of Ford touring cars use their cars regularly or occasionally for carrying goods. Every one of these owners is a live prospect for a Heath DUPLEX.

The vision of this immense market has attracted the very best automobile dealers in the country.

They have seized on the Heath DUPLEX as an opportunity to increase the volume of their business and take up the slack caused by the shortage of motor cars. The Heath DUPLEX is a perfected, patented improvement.

It makes a Ford do the work of two cars at the cost of one. It is protected by exclusive patents and guaranteed by one of the oldest and best rated makers of motor car specialties.

Look for a demonstration at your nearest county or state fair, and realize how you can make ready sales in this enormous Ford field, both on used Fords as well as new.

Some valuable territory is still available. Write us today and we will advise you if we can act on your application.

McCord Manufacturing Company, Inc.
Division D, Detroit

How the Heath DUPLEX Operates

The Heath DUPLEX consists of a folding delivery body, 4 feet 4½ inches long, 32 inches wide, 10 inches deep, and two angle iron supports permanently fitted to the Ford chassis.

In the original installation the Ford tonneau is made removable. To use the car for delivery, the Ford tonneau is lifted off and the delivery body unfolded. To change it back to a passenger car, the Heath DUPLEX is folded up and the Ford tonneau slid back over it. *Either change takes 60 seconds.* No tools are required.

When the car is used for passengers, the Heath DUPLEX folds under the tonneau with no visible sign of its truck utility.

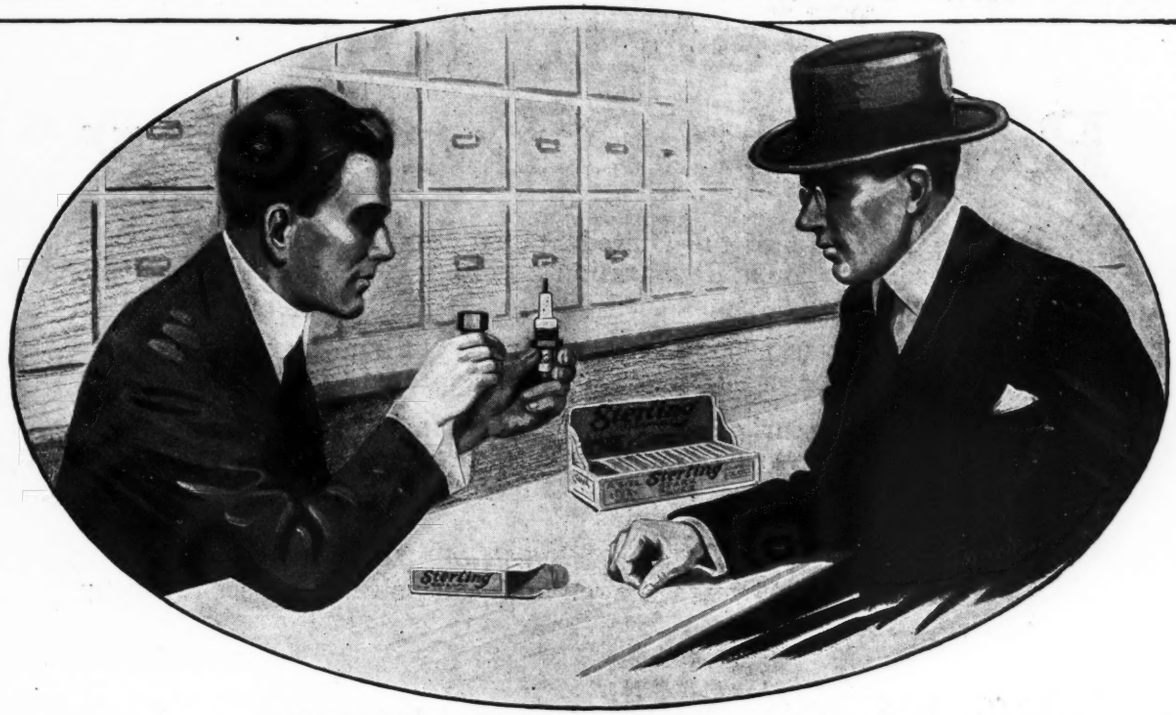
Heath **Duplex**

Makes a Ford a Truck or Passenger Car in 60 Seconds

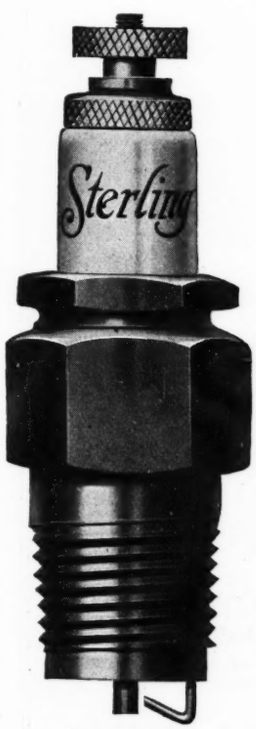
$57.50 f. o. b. Detroit

PATENTED MAY 12 1908, DEC 19 1916

Motor Owners Must Face the Facts—Carbon Must Be Reckoned With—Spark Plugs Must Be Kept Clean



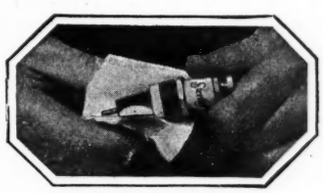
WITH the low grade gasoline we must use today carbon is more and more a factor to be reckoned with. Spark Plugs must be more efficient. A spark full and strong is of first importance. But when carbon does accumulate—motor owners must face the facts—a spark plug must admit of easy cleaning to be most efficient. If combustion is thorough enough to keep carbon burned from the points and porcelain core, very well. If not, cleaning is the only alternative. Sterling Spark Plugs are easily cleaned.



A size and style for every car

Sterling Spark Plugs deliver the full strength of the current through the Monel metal electrode.

With a "fat" spark more thorough combustion results.



Easily Cleanable

Carbon is unburned fuel —it is evidence of poor combustion. Eliminate carbon and you have greater power—quicker response—more miles per gallon—greater economy—money saved.

Better combustion means better performance—a healthy hum in your motor.

If your motor was not originally equipped with separable spark plugs you will replace them eventually. Then put in Sterlings and note the improved performance.

When carbon accumulates they can be easily cleaned and made new again—and when they are cleaned you know they are *positively* clean.

Sterling Spark Plugs are sold by progressive garage and supply dealers.

LOCKWOOD-ASH MOTOR COMPANY

1956 Main Street **Jackson, Michigan**
(45)

Sterling Spark Plugs

Watch for Registration Day

The President of the United States will soon announce by proclamation, a Registration Day to be held as early in September as possible.

More than 2,000,000 men are needed to put our army on a 5,000,000 men basis. 13,000,000 are expected to register.

Class one is nearly exhausted. This Class must be replenished from new registrants not later than October 1st.

Who must register:

All men from 18 to 45 years of age, both inclusive, unless previously registered.

Where you will register:

In the customary voting precincts in the jurisdiction of your Local Selective Service or at other points to be designated.

Sick and non-resident registrants:

These will be furnished cards by their Local Boards. The sick will be registered by persons deputized to do so. Non-residents may register by mail through the County or City Clerk of the place at which they are stopping. Special provision will be made for felons, persons awaiting trial and others confined in jails or institutions.

The Government of the United States asks your hearty co-operation with your Local Board in making the registration a complete 100% catalogue of every man of the ages to be announced in the President's Proclamation. Selection will take place later by the usual classification method.

The penalty for failure to register is one year imprisonment and NO man can exonerate himself by the payment of a fine.

WATCH FOR REGISTRATION DAY!

Approved by
NEWTON D. BAKER
Secretary of War

E. H. CROWDER
Provost Marshal General
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This means that it is not necessary to go over the valve a second time to insure a perfect fit. The Veltum is a big money saver for every garage and service station.

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Will operate at any speed on 15 lbs. of air. Plenty of power to grind any size valve—one machine is all that is necessary, no matter what the size of the valve.

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With the Veltum it is simple and easy to fit oversize valve stems in valve guides, insuring a much better fit than by reaming.

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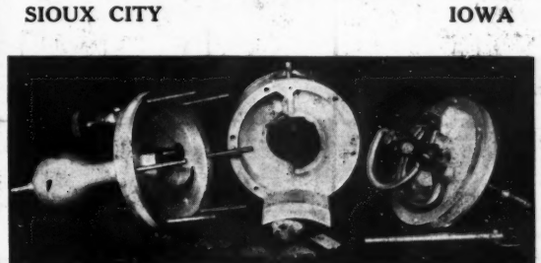

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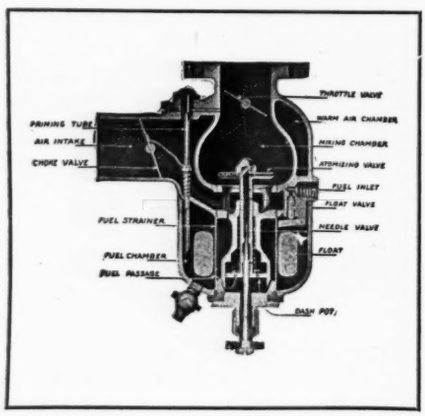
KNOX CARBURETOR

Model "F"

Model "F"

10% to 30% SAVING IN FUEL GUARANTEED



DESCRIPTION

THE simplicity of our carburetor is readily seen by a brief study of cross section cut. It can readily be seen how the fuel or gasoline enters the bowl of the carburetor, how it is taken care of by the float and passed up by the metering needle into the hollow stem of the atomizing valve, from there passing out through the multiple jets where it is picked up by the inrushing air. The atomizing valve working automatically is caused to lift by the vacuum or inrush of suctional air, this valve in turn rides up and down on the metering needle taking more or less gas as it moves up and down. The lower end of the atomizing valve is made in the form of a piston, which works in a chamber carrying fuel, and in turn acts as a dash pot, preventing the valve from chattering or pounding on its seat.

After 15 years devoted to Carburetor manufacture and development, we have finally perfected and now present, in our Model "F" Knox Carburetor, an instrument that we unconditionally guarantee will save 10% to 30% in fuel consumption and give a proportionate increase in engine power and flexibility OVER ANY OTHER CARBURETOR NOW ON THE MARKET!

This carburetor is absolutely automatic. It is simple in design and construction, having only one moving part. When once properly adjusted it takes entire care of itself and the engine's fuel supply. It is not affected by weather conditions or changes in altitude. The mixture is uniformly maintained throughout the entire range of speed and load.

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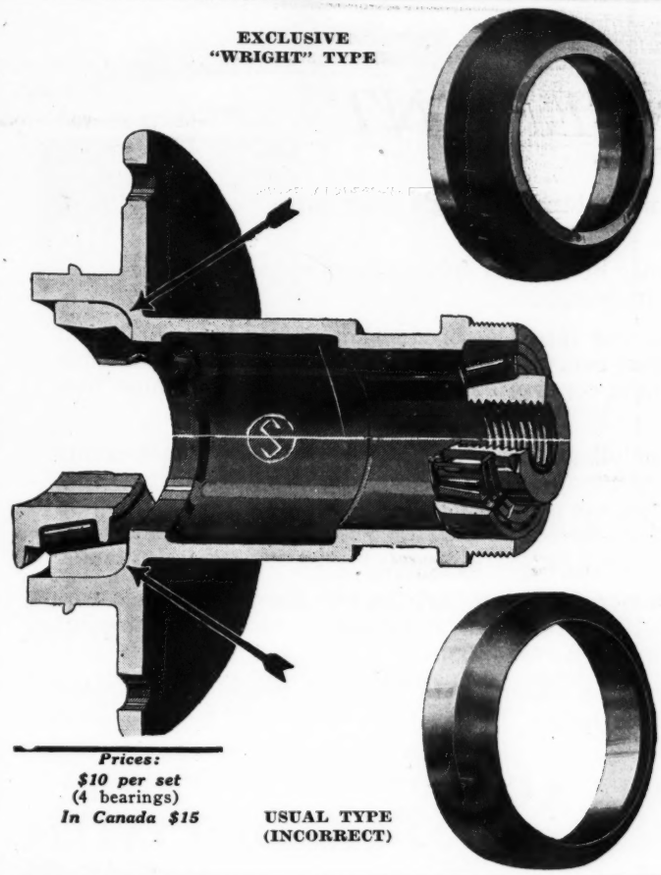

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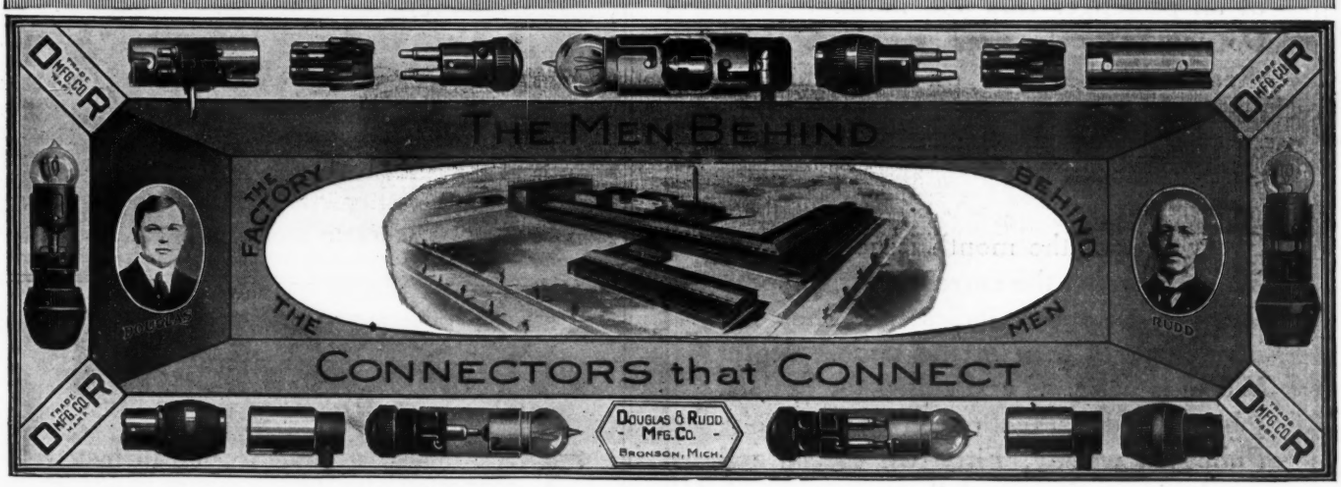

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Naturally, MOTOR AGE regrets the necessity of making this announcement but, to tell the truth, we don't feel like apologizing for this increase.

For several years the cost of everything entering into the production of MOTOR AGE has been increasing. These increases have affected every detail in every department of our business and although we have continued the single copy price established in 1899, it must now be advanced.

For many years it has been MOTOR AGE'S privilege to chronicle all the big and little events that have marked the progress of our wonderful industry—probably the most wonderful progress any industry has ever made. We have spared no expense in our efforts to be the real leader in our field. It has cost money—lots of it—and even the single copy or subscription price does not begin to pay the cost of getting 52 copies (a year's supply) into our reader's hands.

MOTOR AGE has a service to render, an industry to keep thriving; it must continue to be interesting and helpful and positively valuable to its readers. It cannot do this under present conditions and still sell at a price established over 19 years ago.

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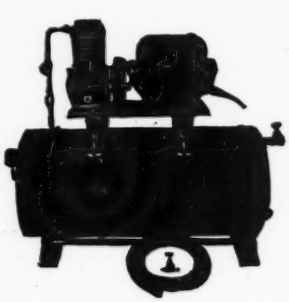

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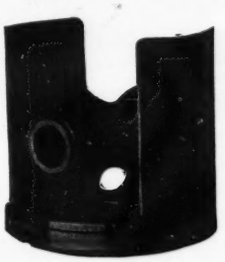

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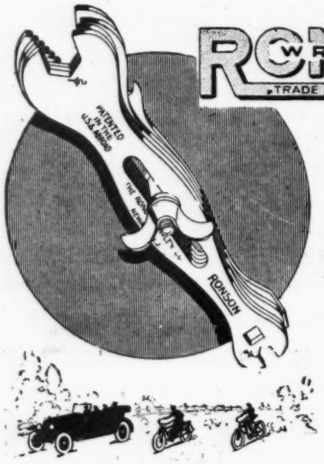

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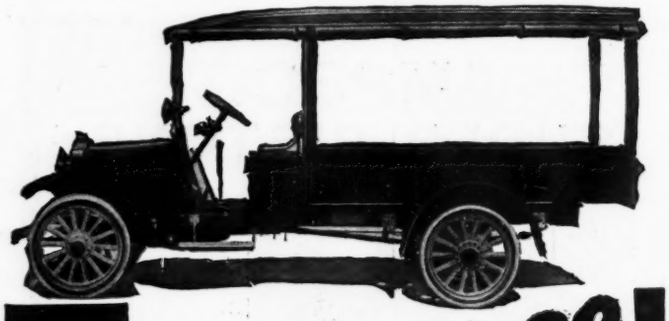

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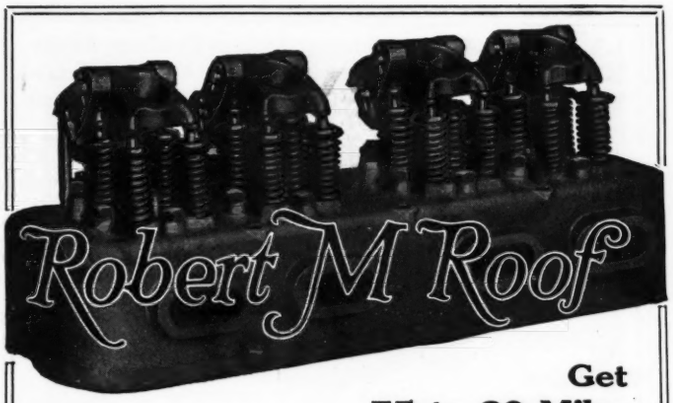

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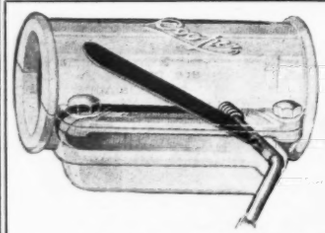

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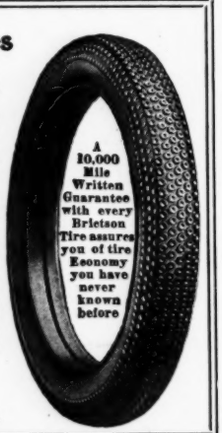

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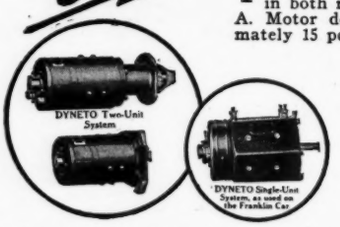

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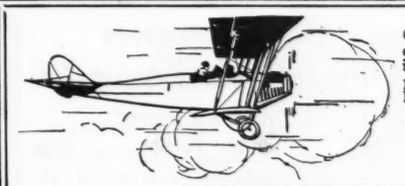

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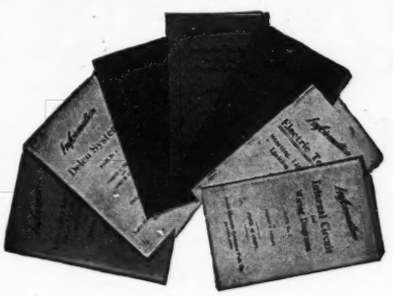

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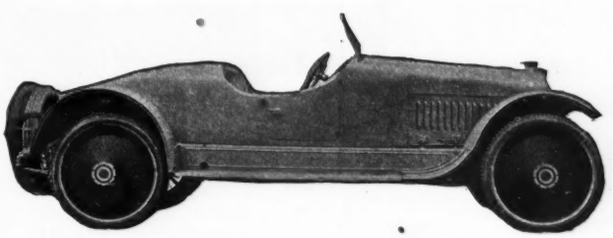

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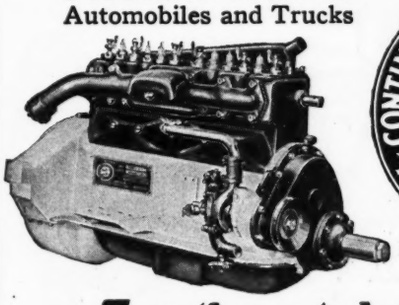

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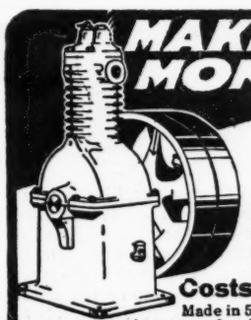

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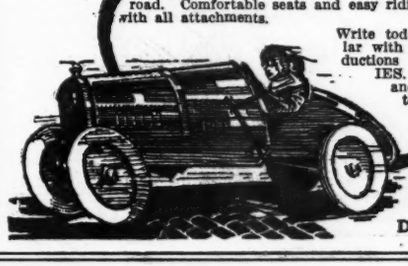

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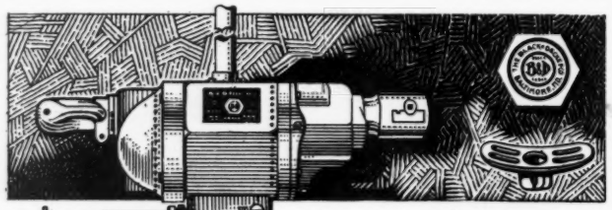

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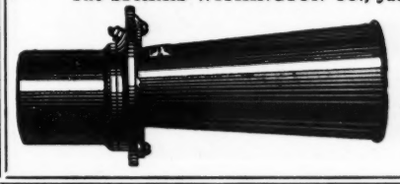

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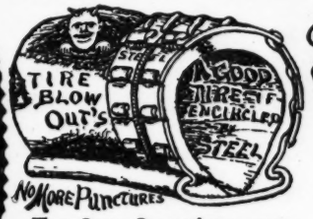

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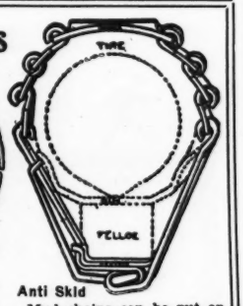

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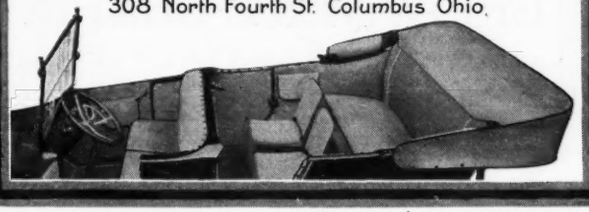

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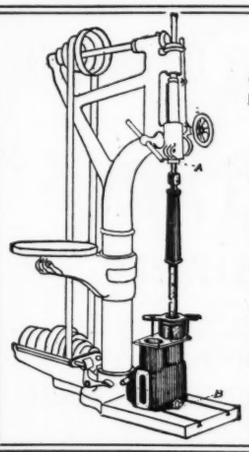

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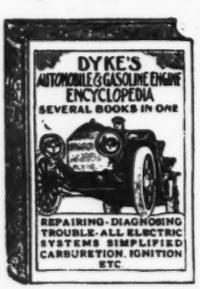

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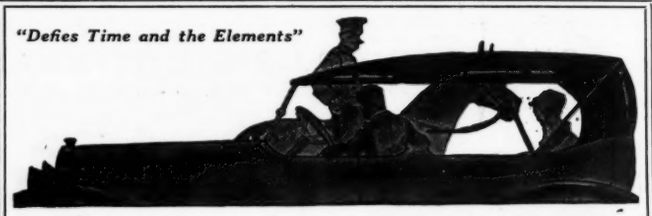

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You will be safe in buying or handling the Disco System, because it is made by the strongest company in this field. The financial and personal standing of the Disco organization is an absolute guarantee of satisfaction.

Let us prove this to you

DISCO ELECTRIC MANUFACTURING COMPANY

DETROIT

ECLIPSE BENDIX DRIVE

Starts 155 Different Makes of Motor Cars and Motor Trucks

Manufactured By

ECLIPSE MACHINE CO.

ELMIRA, N.Y.

PEERLESS

Two-Power-Range Eight

A "Loafing" Range for ultra soft, smooth, economical operation — a "Sporting" Range for exceptional power and speed.

Seven Passenger Touring

$2550

f. o. b. Cleveland subject to change without notice

Peerless Motor Car Co.

Cleveland, Ohio

THE NEW

UTILITY Universal Rim Wrench

Now Belongs in Every Tool Box and Every Garage

Price only **$1.50**

Automatically fits every nut used in connection with demountable rims on all makes of cars. Now beautifully finished in nickel and black enamel. More compact and lighter. Improved throughout. Selling on sight. Complete only **$1.50.**

Write for complete details
Dealers, ask for liberal discounts

THIS NEW WRENCH SELLS

HILL PUMP VALVE CO.

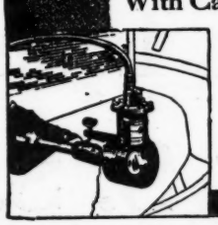
Archer Ave. and Canal St., Chicago

Mfrs. of Famous UTILITY PROTECTED HEATERS for all Motor Cars.

GEARLESS DETROIT CRANK-SHAFT TIRE PUMP

960,000 PROSPECTS

With Cars Between $800 and $1300



Now ready for Briscoe, Dodge, Chandler, Hudson, Overland, Reo, Hupmobile-R, and Studebaker cars. On and off in a jiffy without tools. Not a rubber diaphragm device. Write for details. Dealers, ask for discounts.

Price $12

DETROIT ACCESSORIES CORPORATION

2021 Gratiot Avenue, Detroit, Michigan

Canadian Distributors

Walkerville Hardware Co, Walkerville, Ont.

BOSCH

AMERICA'S SUPREME IGNITION SYSTEM

NEW YORK, CHICAGO, DETROIT, SAN FRANCISCO
WORKS AND FOUNDRIES SPRINGFIELD, MASS.

THE CLEARING HOUSE

OF THE MOTOR INDUSTRY

FOR PARTS, ACCESSORIES, TIRES, MACHINERY, REBUILDING, REPAIRING, WELDING AND USED CARS. ALSO HELP AND SITUATIONS WANTED AND MISCELLANEOUS CLASSIFIED ADVERTISING

WE SERVE AND SAVE

His Majesty "The American Car Owner"

50 to 90% On Used Parts

Parts for Following Cars All Models

Abbott-Detroit	Mitchell
Allen	Moline
American	Moon
Auburn	National
Bergdoll	Nyberg
Brush	Oakland
Buick	Ohio
Cadillac	Oldsmobile
Case	Overland
Chalmers	Packard
Chase	Paige
Cole	Palmer
Crow-Elkhart	Palmer-Singer
Detroiter	Parry
Dorris	Peerless
Elmore	Pierce-Arrow
E-M-F 30	Pope Hartford
Everette	Pope-Toledo
F. A. L.	Premier
Flanders	Rambler
Ford	R.C.H.
Franklin	Regal
Garford	Reo
Glide	Seldon
Great Western	Speedwell
Haynes	Stafford
Herff-Brooks	Stearns
Hudson	Stevens-Duryea
Hupmobile	Stoddard Dayton
International	Studebaker
Interstate	Stutz
Jackson	Thomas Detroit
King	Velie
Kissell	Vim
Krit	Warren
Lexington	Wayne
Lozier	Wescott
Marathon	Winton
Marmon	
Maxwell	
Michigan	

And Many Others

New Gears and Axle Shafts

We have in stock new gears and axle shafts for many makes of cars for less than factory list. Send in old part; we will match it up for you, or give complete description.

OUR GUARANTEE IS YOUR PROTECTION

Any Part, or article, purchased from us, which in your estimation does not give entire satisfaction or fit, may be returned to us and your

Money Cheerfully Refunded

Dealers Our New Bulletin on Parts, Supplies and Material is ready. Write for it today.

MOTORS—Guaranteed

Abbott	$ 75.00
Buick, Model 10	60.00
Case, Model 40	75.00
Cadillac, Model 1914	150.00
E. M. F., Model 30	50.00
Flanders, Model 20	50.00
Packard, Model 1909	85.00
Premier 6 cylinder	100.00
Reo 1910	60.00
Mitchell 6 cylinder	75.00
Overland 42	50.00
Overland 59	60.00
Velie	75.00
Marmon	90.00
Rutenberg	125.00
Michigan 40	100.00
R. C. H.	50.00
Moon 40	75.00
Chalmers 40	90.00
Oakland 30	75.00
Velie 12	100.00
Mitchell 15	100.00

UNIT POWER PLANTS

Chalmers 6, 1913	$125.00
Velie	125.00
Marathon	85.00
Detroiter	90.00
Paige 25	90.00
Imperial	100.00

RADIATORS

Velie 1912	$20.00
Stutz, 1912	25.00
Maxwell Spc.	17.50
Mitchell, 1915	22.50
Flanders	15.00
Mitchell 1911	16.50
Chalmers 40	20.00
Imperial	20.00
E-M-F	15.00
Krit, 1914	17.50
Reo	15.00
Haynes, 1911	20.00
Hudson 37	22.50
Kline Car	20.00
Marmon, 1911	20.00
Chalmers 30	17.50
Regal, 1911	17.00
Chandler, 1916	30.00
Empire 20	16.00
Detroiter 1914	18.50
Moon, 1911	17.50
R. C. H., 1913	15.00
Marathon, 1912	17.50

NEW RADIATORS

Overland 85	$22.50
Ford	22.00

NO MATTER WHAT YOU NEED

NEW PARTS—SUPPLIES
USED PARTS—MATERIALS
We Can Save Money for You

Write to Us—Let Us Convince You—Write Today

—The— Original **Auto Parts Co., Inc., of St. Louis**

St. Louis, Missouri

BRANCH:
AUTO PARTS COMPANY
DAVENPORT, IOWA

Buy **W. S. S.**

AUTO SALVAGE BULLETIN No. 6

COME!

LET'S GET TOGETHER

Better Goods *Better Prices* *Faster Shipments*

BELOW IN SIX DIFFERENT SQUARES WE STATE FACTS WHY YOU SHOULD DO BUSINESS WITH US

TREMENDOUS ORDERS

In 9 months past we shipped 3,162 orders to 29 different states, Mexico, Canada, and the Philippine Islands.

IMMENSITY OF BUSINESS

We have shipped orders to Mexico, Canada, Japan, Philippine Islands, Cuba, South Africa, Sweden, Porto Rico and every state in the United States.

RE-ORDERS AND SAVINGS

Our records show that 93% of all our new customers send us re-orders; also that we have saved our customers over $250,000.00

Used Parts for Any Models of the Following Manufacturers' Makes:

Abbott-Detroit	Little
American	Locomobile
Apperson	Lozier
Atlas	Marmon
Atterbury	Marquette
Auburn	Matheson
Bergdoll	Maxwell
Brush	Michigan
Buick	Mitchell
Cadillac	Moline
Carter Car	Moon
Case	National
Chadwick	Nyberg
Chalmers	Oakland
Chase	Ohio
Cino	Oldsmobile
Cole	Overland
Crow-Elkhart	Packard
Dorris	Paige
Elmore	Palmer-Singer
E-M-F 30	Parry
Everett	Peerless
F.A.L.	Pierce-Arrow
Firestone	Pope Hartford
Flanders	Pope Toledo
Ford	Premier
Franklin	Rambler
Garford	R.C.H.
Gleason	Regal
Glide	Reo
Great Northern	Schacht
Great Eagle	Seldon
Great Smith	Speedwell
Great Western	Stafford
Havers	Stearns
Haynes	Stevens-Duryea
Herff-Brooks	Stoddard-Dayton
Henderson	Studebaker
Hudson	Stutz
Hupmobile	Thomas-Detroit
International	Velie
Interstate	Vim
Jackson	Warren
King	Westcott
Kissell	Winton
Knox	Wayne
Krit	

ENORMOUS STOCKS

We have the largest stock of used parts in the world.

PARTS FOR

600 Models

AND OVER

110 Different Makes

RELIABILITY AND SERVICE

We ship only good serviceable parts that can be relied upon. We ship your order the same day it is received.

SAVING AND GUARANTEE

GUARANTEED SAVING OF

35 to 90%

OUR GUARANTEE

You must be satisfied. Any article purchased from us which does not give complete satisfaction, may be returned at our expense. Your money will be cheerfully refunded.

EVERYTHING FOR ANY AUTOMOBILE. NO MATTER WHAT YOUR NEEDS ARE, WRITE US. WE WILL SERVE YOU, QUICKLY, RELIABLY : : : : : : : : : : : : : : :

Watch Next Week for Our Bulletin No. 7

AUTO SALVAGE CO., INC.

KANSAS CITY, MISSOURI
1701-03 Main Street

ST. LOUIS, MISSOURI
2823-25 Locust Street

CINCINNATI, OHIO
314 E. Third Street

Do You Have Trouble Getting Parts?

"We Tear 'Em Up and Sell the Pieces"

That's Our Business!

Parts for Over Three Hundred Different Models

Stock Changes Every Day

Saving Is the Watchword of the Day

We Save You Money

Auto Wrecking Co.

13th & Oak
Kansas City
MISSOURI

Rapid Fire Service and Lowest Prices

ON GOOD SERVICEABLE PARTS FOR ALL CARS

If We Cannot Satisfy You, Money Cheerfully Refunded

SPECIAL MOTOR BARGAINS

All in excellent condition

4 cyl. 1914 Mitchell	$100.00
4 cyl. 1913 Big Mitchell	100.00
4 cyl. 1914 Mitchell starter and generator	125.00
1914 Oldsmobile (Defender model)	100.00
4 cyl. Oldsmobile (Autocrat model)	150.00
6 cyl. Thomas Motor (cast in pairs)	125.00
1911 Packard	100.00
1912 36 Pierce Arrow	125.00
New Marion Motor	100.00
4 cyl. 1914 Moon with starter	100.00
4 cyl. 1913 Buda	85.00
1913 Atlas	75.00
6 cyl. 50 H. P. Rider-Lewis (fine for boat)	100.00
1914 Marmon	100.00
1915 Krit	65.00
83 Overland with starter	85.00
6 cyl. 1914 Jeffery with starter and generator	125.00
6 cyl. Everitt	85.00

UNIT POWER PLANTS

4 cyl. Continental—complete	$100.00
4 cyl. Milwaukee—complete	100.00
1914 Lozier 6	200.00
1914 Premier with starter	150.00
4 cyl. Chalmers 30	65.00
6 cyl. Stevens-Duryea — complete	150.00
4 cyl. 1913 Abbott-Detroit with starter and generator	150.00
1914 Allen	$115.00
1917 6 cyl. Regal	100.00
1915 6 cyl. Master Chalmers	150.00
1916 6 cyl. Chalmers 30	125.00
1914 6 cyl. Cole	135.00
1914 6 cyl. Oldsmobile	135.00
Buick 35	100.00
1916 Le Roi	65.00
Hupp 20	40.00

Liberal allowance made on your old motor

Cylinder Blocks, Pistons, Shafts, etc., for most all motors

MAGNETOS

Overhauled and Guaranteed

DU4 Bosch Set Spark	$18.00
DU4 Bosch Variable Spark	22.50
DU6 Bosch	27.50
DR4 Bosch	18.00
DR6 Bosch	22.50
D4 Bosch	15.00
D6 Bosch	17.50
NU4 Bosch	15.00
ZR6 Bosch	35.00
Eisemann Dual	15.00
Remy Model RL & D	7.00
Dixie Mags.	12.00

We carry in stock all magneto parts

GENERATORS

Gray & Davis	$15.00
Ward Leonard	12.00
Remy	18.00
Vesta	12.00
Beardon	12.00
Apple	10.00

STARTERS

Gray & Davis	$15.00 to $20.00
Remy	15.00
Ward-Leonard	20.00
Auto Lite, Bendix Drive	25.00
Auto Lite, Gear Drive	20.00
Wagner	25.00
Westinghouse	25.00
Delco	25.00

COILS

Bosch Type A	$7.00
Eisemann	4.00
Splitdorf	4.00
Simms, H. T.	12.50
Mea	10.00

Silent Starter and Generator Chains; all lengths and sizes.

NEW HEADLIGHTS

Gray & Davis 12-in. face, two-bulb type	$5.00
Special 12-in. face, two bulb type	4.00
New steering posts	5.00

SECOND-HAND CAR DEPT.

$150.00 to $550.00

50 to 75 exceptionally good used cars at prices so low that they would even interest dealers.

PREST-O-LITE TANKS

B-Presto Tanks	$5.00
E-Presto Tanks	4.00
Searchlight	3.00

SPEEDOMETER HEADS

Stewart or Warner $1.50 to $4.00

RIMS

All Styles and Makes

Stanweld	$2.50
Funk	2.00
Reversible Firestone	2.00
Continental	2.50
All other makes	1.50

TIRES AND TUBES

We wreck many cars every day and thus obtain great quantities of exceptionally good Tires and Tubes at prices that will interest you.

New Steering Posts	$5.00
Front Axles	$5.00 to $10.00
Rear Axles	15.00 to 40.00
Radiators	10.00 to 35.00
Transmissions	15.00 to 100.00
Carburetors	5.00 to 9.00
Bearings	.50 to 3.50
Springs	1.00 to 3.50
Transmission Gears	1.00 to 5.00
Differential Gears	5.00 to 10.00
Axle Shafts	2.00 to 8.00
Gasoline Tanks	1.00 to 5.00
Lamps	50c to 5.00
Windshields	3.50 to 8.00
Spotlights	3.50
Stewart Vacuum Tanks	4.00
Carter Tanks	2.50

300 new Adjustable T Bumpers, nickel or black, fit all cars except Fords.....$4.50 each
14,000 ft. new radiator hose, price per ft., 1-in., 20c; 1¼-in., 25c; 1½-in., 30c

Mail Orders Shipped Same Day *Highest Prices Paid for Wrecked Cars*

WARSHAWSKY & CO., *Largest Car Wreckers in the West*

Phone Calumet 7315 1915 S. State St., CHICAGO, ILL.

STOP! LOOK! LISTEN!

WE HAVE USED PARTS FOR MOST ANY CAR MADE. LET US FILL YOUR ORDER TODAY. WE GUARANTEE SATISFACTION OR MONEY REFUNDED

MOTOR BARGAINS

Buick, 31 unit power.....$100.00
Everritt 30 ..... 50.00
R. C. H..... 40.00
Cadillac 50.00
Studebaker 17 ..... 50.00
Overland 72 ..... 50.00

MAGNETOS

All makes.....$5.00 and up
Bosch Z. R. 4, 2 spark dual clockwise with coil and switch.....$100.00

CARBURETORS

All makes.....$3.00 to $5.00

STARTERS

From.....$10.00 and up

GENERATORS

From.....$5.00 up

GEARS

From .....$1.50 to $10.00

BEARINGS

From.....$0.50 to $5.00

SPROCKET CHAINS

From.....$1.00 to $2.00

USED TIRES

40x4 plain S. S.....$15.00
No mileage guarantee.

RADIATORS

Packard 30 .....$45.00
King 8 ..... 35.00
Hupp 20 ..... 15.00
Oakland 42 ..... 25.00
Reo 1912 ..... 25.00
Hudson 33 ..... 30.00
Overland 80 ..... 25.00
Overland 79 ..... 25.00
Buick 55 ..... 30.00
Paige 1918 ..... 45.00
Jeffery 35.00
In addition to these we have about 50 more. All guaranteed.

SAVE 50 to 80%
And gain satisfaction. Real goods at real prices. Quick Shipments.

REAR AXLES

All makes.....$25.00 to $75.00

FRONT AXLES

All makes.....$5.00 to $15.00

TRANSMISSIONS

All makes.....$20.00 to $25.00

AXLE SHAFTS

All makes.....$1.50 to $8.00

SPRINGS

All sizes.....$1.50 to $3.50

SPRING LEAVES

From .....25c to 75c

GAS TANKS

All kinds.....$1.00 to $8.00

COILS

All kinds.....$3.00 to $8.00

SPEEDOMETER HEADS

From.....$1.50 to $4.00

DIFFERENTIAL GEARS

From .....50% to 80% off list

TRANSMISSION GEARS

From .....50% to 80% off list

HOUK WIRE WHEELS

For Marmon, 34x4 C.....$15.00

We offer greater savings on reliable goods. Write us. We will prove it to you. Let us fill your next order. Remember: "A dollar saved is a dollar made."

U. S. MOTOR PARTS CO.

401-6 East Eighteenth St.
KANSAS CITY, MO.

"The Used Parts House of America"

REMOVAL SALE

In order to save moving material to new and larger quarters, I offer the following new material at much reduced prices:

Westinghouse No. 209R generators, 6 volt complete with regulator, each..$ 20.00
Hartford Shock Absorbers, per set of 4 ..... 12.00
Eisemann 6 cyl. magnetos, automatic advance, clockwise rotation, each.... 37.50
6 cylinder Motors (Unit Power Plant 3½ x 5), each..... 165.00
Warner Transmissions with clutch and lever for above motor complete, each 40.00
Bosch 2 spark 4 and 6 cylinder magnetos, each..... 65.00
Timken Bearings No. 315, each..... 1.80
Timken Bearings No. 365, each..... 2.25
Timken Bearings No. 418, can be used to replace No. 415, each..... 2.70
Timken bearings No. 444, can be used to replace No. 440, each..... 2.80
Annular Bearings No. 219, assorted makes, each.....$ 15.00
Annular Bearings No. 314, assorted makes, each..... 12.00
Annular Bearings No. 316, assorted makes, each..... 17.00
Large Truck Radiators, suitable for tractors, each..... 30.00
Two conductor Steel Armored Wire (B & S) No. 14, per 1,000 feet..... 42.00
Three conductor cloth Black Braided Wire, per 1,000 feet..... 32.50
Primary Wire, No. 14 Brass braided cover, 41 strand, per 1,000 feet..... 28.00
Flexible Steel Tubing, ⅜" I. D., ½" O. D., per 100 feet..... 20.00
Spicer Universal Joints, each..... 3.50
Universal Joint companion flanges, assorted sizes, each..... .50

I also have a large stock of other bearings and other material suc has lamps, ignition sets, magnetos, wire, steering gears, axles, etc. Send for complete list.

S. BREAKSTONE

1322-26 Michigan Avenue CHICAGO

Used Auto Parts Company

Joplin Missouri

PARTS FOR 200 Cars

Our immense stock assures you of getting what you want, very quickly and at a saving of from

50 to 75%

We have:

Motors	Radiators
Transmissions	Crankcases
Rear Axles	Crankshafts
Magnetos	Cylinder Blocks
Generators	Springs
Starters	Bearings
Coils	Wheels
Carburetors	Most Gears

In fact, any part you may desire. It will pay you to let us have your order. Money refunded if goods are not satisfactory

GET OUR PRICES TODAY

No matter how large or small your order is, it will be handled promptly and carefully. "The Key to Our Success."

— I F —

IT'S FOR A "FORD" CAR—WE HAVE IT.
Write for Catalog and Price List.
IF IT'S FOR A "FORD" CAR—WE HAVE IT.

UNIVERSAL MOTOR SUPPLY CO.
White Plains, New York

Parts and Repairs. *Parts and Repairs.* *Parts and Repairs.*

PARTS FOR ALL CARS

We Save You 50 to 80% of the Original Cost

MAGNETOS

Bosch DU Set spark	$16.50
Bosch DU4 & 6 Variable	20.00
Bosch DR4	16.50
Bosch DR6	20.00
Bosch D4	12.00
Bosch D6	15.00
Bosch ZR6 with coil	35.00
Eisemann	10.00
Remy	7.00
Dixie	10.00

Coils, Generators and Starters. Silent Starter and Generator Chains, all lengths and sizes.

Lighting and Starting Batteries, $6.00 to $15.00

Carburetors	Springs
Front Axles	Transmission
Rear Axles	Gears
Transmissions	Differential Gears
Axle Shafts	Rims

Pistons, Cylinder Blocks,, Crank and Camshafts, Radiators, etc. Many good motors in stock. Tell us your needs

In wrecking cars we obtain and always have for sale a complete stock of parts for all makes of cars. Also tires and tubes whereby we can save you from 50 to 80 per cent

OUR SLIGHTLY USED TIRES AND TUBES

MEAN ECONOMY TO MOTORISTS :: A TRIAL WILL CONVINCE YOU

Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3	$4.00	$1.35	32x4	$7.00	$1.60	35x4½	$8.50	$1.80
30x3½	5.00	1.45	33x4	7.75	1.70	36x4½	8.75	1.85
31x3½	5.25	1.50	34x4	7.75	1.70	37x4½	9.25	1.90
32x3½	5.50	1.50	35x4	8.00	1.75	35x5	9.50	2.00
34x3½	6.00	1.60	36x4	8.00	1.75	36x5	9.50	2.00
31x4	6.25	1.65	34x4½	8.25	1.75	37x5	10.00	2.20

SPECIAL—Four 41x5 Tires, Rims and Tubes, $80.00

PROMPT ATTENTION TO MAIL ORDERS

No Mileage Guarantee on Used Tires *Deposit Required with All Orders*

MOTOR SALVAGE CO., 1425 State St., Chicago, Ill.

Every Motorist Can

SAVE MONEY

On These Bargains with

Puritan Quality

Extra Values in Casings and Tubes

These casings are factory seconds that will give excellent service. They have no mileage guarantee. Both the casings and the tubes are good values and will go fast—better order early.

CASINGS

30x3	smooth tread	$10.00
32x3½	non-skid	14.95
31x4	non-skid	20.00
33x4	non-skid	21.70
34x4	non-skid	21.95
30x3½	non-skid, Ford size	14.50

TUBES

30x3	Heavy grey tubes	2.50
32x3½	Heavy grey tubes	3.85
31x4	Heavy grey tubes	4.65
33x4	Heavy grey tubes	4.90
34x4	Heavy grey tubes	5.15
30x3½	Red or Grey	3.00

New Made-to-Order One-Man Tops

We make the low, graceful one-man top to fit any car. It can be easily put in place as it fits the old top fittings.

5-passenger one-man mohair top	$45.00
7-passenger one-man mohair top	47.50
Roadster one-man mohair top	27.50
Ford Touring one-man mohair top	35.00
Ford Roadster one-man mohair top	25.00

These prices include the complete top, storm curtains, top dustproof boot with special attachment for connecting top to any windshield.

New Tops for Old Ford Frames

These outfits consist of new heavy 32-ounce rubber roofing—quarters, back curtains, with celluloid lights, back stays, all stitched and ready to slip over the old top frame.

For all models—Ford touring cars	$12.00
For all models—Ford Roadsters	9.00

Special Price on Side Curtains for Fords

For regular Ford top—Touring type	$10.00
For regular Ford top—Roadster	7.00

Made of the best 32-ounce high grade rubber. Dealers should write for prices on tops and curtains.

Piston Ring Special Prices

High grade rings up to 5 inches in dozen lots each at 25c
High grade rings, 5 inches and over in dozen lots, each at 45c
Write for a copy of our

FREE bargain bulletin

Puritan Machine Co.

48 Puritan Building
415 Lafayette Blvd., DETROIT, MICH.

BUY YOUR USED PARTS FROM THE LARGEST USED PARTS CONCERN IN NEW YORK STATE

50 to 80% Off List Price

Crank Cases	$10 to $75	Cylinder Blocks	$ 5 to $40
Crank Shafts	5 to 35	Radiators	10 to 40

Gears — Bearings — Springs

Our stock of the above parts is practically complete. Lamps, Tires, Carburetors, Magnetos, Coils, Wheels, Rear Axles, Motors. Anything for the automobile.

Money refunded if goods are unsatisfactory

ROCHESTER AUTO PARTS, INC., 135 Culver Rd., ROCHESTER, N. Y.

WIRE WHEELS

New, Rebuilt, Repaired

SINGLE WHEELS OR SETS
All Makes, All Sizes
PARTS AND TOOLS
Quick Delivery, Best Prices

We are prepared to meet any emergency arising out of the use of wire wheels.

WIRE WHEEL REPAIR CO.
146 W. 55th St., New York City

OTHERS SAVE! WHY NOT YOU?

Almost 50% Saved on Your Tire Bills

Write Us for Price List

NEW TIRES USED TIRES
DOUBLE TREAD TIRES

SERVICE AND SATISFACTION GUARANTEED
—PARTS FOR ALL AUTOMOBILES—
Gears, Shafts, Bearings
Write us your needs

AUTO NEEDS COMPANY
1602 S. Michigan Ave. Chicago, Ill.

ABBOTT
and
ABBOTT-DETROIT
OWNERS

Are assured prompt, complete, and satisfactory service direct from our factory at Cleveland, where we have the necessary drawings, patterns, tools, fixtures and a large supply of parts.

All repair orders and correspondence should be addressed to

THE ABBOTT MOTOR CAR COMPANY
Cleveland, Ohio

AUTO SAVE 50-90% FOR 400 CARS PARTS

POPE, PACKARDS, PIERCE, KNOX, ETC.

Motors	$25.00 up	Presto Tanks	$ 4.50 up
Magnetos	4.00 "	New Spotlights	3.00 "
Carburetors	3.00 "	Generators	10.00 "
Rear Axles	15.00 "	Gears	1.00 "
Front Axles	5.00 "	Bearings	1.00 "
Cylinders	5.00 "	Radiators	10.00 "

Jobbers in Bankrupt Auto Supplies

BRIGHTMAN AUTO EXCHANGE
84 Wooster St., Hartford, Conn.

New Parts for
ORPHAN CARS

We make a specialty of furnishing new gears and axle shafts, axles, repair parts for motors and transmissions for cars that have been discontinued.

CUTTING MOTOR CARS
CLARK CARTER CARS
MILWAUKEE MOTOR
(All cars using same)
CONTENTAL ENGINE CO.
(Repair parts)
MASON MOTOR CARS
IMPERIAL MOTOR CARS

L. C. ERBES & CO.
2652 W. University Ave. St. Paul, Minn.

—POPE HARTFORD PARTS—

Buy your parts for all models of Pope Hartford cars from the only legitimate and authorized manufacturers—who own the original drawings, patterns, tools and fixtures and are making these parts daily. Don't buy and use second hand parts. They may be the cause of serious accidents and result in much additional expense in the long run.

THE HARTFORD MOTOR CAR CO.
410 Main Street Hartford, Conn.

Parts and Repairs.

Bargains in Bodies

4-pass. Chummy, 106" long, uph., painted, top and shield	$125.00
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Size	Plain	Non-Skid	Tubes	Size	Plain	Non-Skid	Tubes
28x3	$ 9.15	$ 9.55	$1.80	34x4	$19.30	$20.25	$3.40
30x3	8.70	9.40	1.95	36x4	20.75	21.50	3.65
30x3½	11.35	11.95	2.30	34x4½	24.85	27.45	4.15
32x3½	12.75	14.45	2.40	35x4½	25.90	27.60	4.30
31x4	17.65	18.50	3.00	36x4½	26.70	29.20	4.40
32x4	18.10	19.00	3.05	37x5	33.75	34.45	5.30
33x4	18.75	19.60	3.25	35x5	32.75	34.40	....

We warrant each and every casing to give satisfactory service, but do not give any definite mileage guarantee

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Size	Tires	Tubes	Size	Tires	Tubes	Size	Tires	Tubes
30x3	$ 4.00	$1.35	32x4	$ 7.00	$1.60	35x4½	$ 8.50	$1.80
30x3½	5.00	1.45	33x4	7.75	1.70	36x4½	8.75	1.85
31x3½	5.25	1.50	34x4	7.75	1.70	37x4½	9.25	1.90
32x3½	5.50	1.50	35x4	8.00	1.75	35x5	9.50	2.00
34x3½	6.00	1.60	36x4	8.00	1.75	36x5	9.50	2.00
31x4	6.25	1.65	34x4½	8.25	1.75	37x5	10.00	2.20

Send $1.00 deposit with each tire ordered. Tires will be sent promptly C. O. D., with privilege of examination. Specify style of rim to avoid delay.

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Size	Tires	Tubes	Size	Tires	Tubes
30x3	$ 4.00	$1.35	35x4	8.00	1.75
30x3½	5.00	1.45	36x4	8.00	1.75
31x3½	5.25	1.50	34x4½	8.25	1.75
32x3½	5.50	1.50	35x4½	8.50	1.80
34x3½	6.00	1.60	36x4½	8.75	1.85
31x4	6.25	1.65	37x4½	9.25	1.90
32x4	7.00	1.60	35x5	9.50	2.00
33x4	7.75	1.70	36x5	9.50	2.00
34x4	7.75	1.70	37x5	10.00	2.20

Freight Prepaid on all orders exceeding $50.00 when check in full accompanies order, otherwise $1.00 deposit with each tire ordered. Specify style of rim to avoid delay.

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28x3	$ 8.00	$2.00	31x4	$16.45	$3.10	34x4½	$22.95	$4.05
30x3	8.45	2.20	32x4	16.95	3.25	35x4½	23.60	4.15
30x3½	11.30	2.40	33x4	17.25	3.40	36x4½	23.95	4.25
31x3½	11.95	2.50	34x4	17.95	3.60	37x4½	24.95	4.35
32x3½	12.95	2.65	35x4	18.45	3.75	35x5	26.25	4.55
34x3½	14.45	2.80	36x4	18.95	3.90	36x5	27.00	4.75
30x4	16.00	3.00				37x5	27.95	5.00

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30x3	8.75	2.00	36x4	22.35	3.85
30x3½	11.35	2.30	34x4½	25.65	4.15
32x3½	13.35	2.45	35x4½	26.75	4.20
34x3½	15.50	2.55	36x4½	27.20	4.30
31x4	17.45	3.20	37x4½	31.15	4.70
32x4	17.75	3.35	35x5	30.55	4.65
33x4	18.55	3.50	36x5	32.90	4.85
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32x3½	6.50	35x4½	9.50
31x4	6.50	36x4½	9.50
32x4	7.00	37x4½	10.00
33x4	7.50	35x5	10.00
34x4	8.50	37x5	11.00

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The kind that will satisfy all customers.

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30x3½	5.00	34x4½	8.25
32x3½	6.00	35x4½	8.50
31x4	6.50	36x4½	8.75
32x4	7.00	37x4½	9.50
33x4	7.75	37x5	10.00

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32x3½	15.23	16.11	35x4½	29.31	32.83
31x4	19.85	21.65	36x4½	24.69	30.36
32x4	20.15	22.95	37x5	35.69	44.50

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VAN SICKLEN SPEEDOMETERS
WALTHAM SPEEDOMETERS
HEINZE SPRINGFIELD FORD STARTERS

LET THE MAN WHO KNOWS HANDLE YOUR REPAIR WORK

Arthur Jones Electric Co.
ESTABLISHED 1903
2837 S. STATE ST. CHICAGO, ILL.

MANY FIRMS ARE GETTING BUSINESS by teling of their facilities in these sections. Why not you?
Full information gladly given

CLASSIFIED DEPARTMENTS
Motor Age, Mallers Building, Chicago

RADIATORS REPAIRED PROPERLY

Anybody may attempt to repair your radiator. To succeed is another matter.

SEND IT TO DENVER
W. H. NEVEU, "The Radiator Man"
Largest in the West. 1327-35 Broadway, Denver, Colo.

AFFA Steering Spindle Adjuster

Also other Specialties for Jobbers, Dealers, write for prices. Goods guaranteed. **FORDS**

AFFA SPECIALTY CO.
34-B Southbridge St. Worcester, Mass.

Send It to Detroit

Official Service and Parts Representatives for Atwater-Kent, Auto-Lite, Berling, Bijur, Connecticut, Delco, Dyneto, Heinze-Springfield, K.-W. Ignition, Klaxon, Remy, Simms-Magnetos, Westinghouse, etc.

COMPLETE STOCK OF
GENUINE PARTS
All work and parts guaranteed

AUTO ELECTRIC & SERVICE CORP.
11 TO 19 SELDEN AVENUE
PHONE: GLENDALE 3353

RADIATORS

OUR HONEYCOMB RADIATOR embodies
STRENGTH COOLING POWER NEATNESS
Repairing and recoring old radiators. Everything in the automobile sheet metal line
We solicit your inquiries

ILLINOIS AUTO SHEET METAL WORKS
Veteran Radiator Experts of the West
3200 S. Michigan Ave. Chicago, Ill.

WANTED

Reliable Firms to Advertise in This Section. Let us tell you how thoroughly, yet economically, you can reach the motor car field.

Classified Advertising Departments
MOTOR AGE, Mallers Bldg., Chicago

Pioneer **RADIATOR** ***Manufacturers***

Rebuilding, Repairing, and Manufacturing of Radiators for any make of car. Why send your Radiator down East when you can ship to us; save time, expense, freight, money, and be assured of expert workmanship? Our prices are right. We make new Radiators and allow for old ones.

TODD MANUFACTURING CO. Minneapolis, Minn.

Cars for Sale. Patents and Patent Attorneys. Help Wanted. *Help Wanted.* *Help Wanted.*

For Sale: Three Studebaker 16-pass., one-ton bus cars, practically new, in good shape and mechanical order. Perfect tires; also one-ton Buick 18-pass. model, just the car for hotels, parks, or camps; sale reason, loss of business. Photo and prices furnished on application, or offers considered.

LYONS & FULTON BRIDGE COMPANY
Lyons, Iowa

FOR SALE

Limited number of new 7-pass. Sedan bodies, painted and trimmed in cloth, by a prominent passenger car manufacturer. Address

BOX 878, Care of
MOTOR AGE

C. L. PARKER

Formerly Member Examining Corps, United States Patent Office

ATTORNEY-AT-LAW AND SOLICITOR OF PATENTS
American and foreign Patents secured. Searches made to determine patentability and validity. Patent suits conducted. Pamphlet of instructions sent upon request.

McGill Building, WASHINGTON, D. C.

CONTRACT WORK

Advertisers in this section have facilities at their disposal to take on additional work on contract. Automobile specialties of all kinds manufactured on contract basis. Special machinery, press work, auto machine work, foundry work, automatic screw machine work.

STEINLE TURRET LATHE OPERATORS

Skilled Steinle Turret Lathe operators are wanted to help speed the production of airplane engines in our new Liberty motor factory. Experienced machinists who have previously operated Gisholt or similar types of machines will quickly be able to operate the Steinle turret lathe efficiently.

This is a splendid opportunity to serve your country to the best possible advantage in a new factory, which is fitted with the finest machinery and equipped with every convenience to assure your best work. Address

Box E-879, Care of MOTOR AGE

PARTS and ACCESSORIES

We are in a position to manufacture PARTS and ACCESSORIES. Will manufacture on contract or royalty basis. Prompt attention and delivery. Send us your proposition and blue prints.

SCHLOEMER MFG. CO.
388-90-92 Division St. Oshkosh, Wis.

THE "REAL" BEGINNING OF MANY A FIRM

Is reckoned from the date of their first advertising in these columns. If you need more business, we may have an inspiring story from someone in your line.

Ask us how it was done

CLASSIFIED ADVERTISING DEPARTMENTS
MOTOR AGE MALLERS BLDG. CHICAGO, ILL.

SKILLED AUTOMOBILE MACHINISTS

WANTED AT ONCE

A builder of high class cars requires expert workmen in the following lines:

Potter and Johnson, J & L Operators, Lathe hands, External and Internal Grinders, Gridley Operators, Drill Press and Milling Machine hands, Tapping Machine and Radial Drill hands, Valve Grinders, Aluminum Welders and Chassis Assembly men.

Steady work guaranteed to good men. Best working and living conditions. We cannot consider the application of men now engaged on war work. Apply immediately by letter. Address

Box 881, Care of MOTOR AGE

Help Wanted. *Help Wanted.* *Help Wanted.*

Steinle Turret Lathe Operators, Grinders, Engine Lathe Men and Bench Men

FOR LIBERTY ENGINES

Skilled Steinle Turret Lathe operators are needed in our Liberty engine factory to speed airplane engine production, for our men over seas. Experienced machinists who have previously operated Gisholt or similar lathes can quickly learn to operate the Steinle. We also need External and Internal Grinders, Engine Lathe men and Bench men to help speed production in this important branch of the government's work.
This is a splendid opportunity to serve your country to the best possible advantage in a new factory, which is fitted with the finest machinery and equipped with every facility to insure your best work.
We cannot consider the application of men now engaged on war work.

Address BOX No. 880, Care MOTOR AGE

Production Engineers on Airplane Engines

We want an able gasoline motor "Production Engineer" for our airplane engine factory. The place is as big as the best man can make it. There is no finer opportunity to help win the war than in this position.

Address Box 876, Care MOTOR AGE

Help Wanted. *Help Wanted.*

All Classified forms now close Friday noon. Be sure all orders and copy are mailed to reach us not later than Friday morning.

MOTOR AGE

A FACTORY IN THE MIDDLE WEST

with a production capacity of twenty thousand truck motors desires to engage the service of a production manager whose ability can handle this and a further substantial increase in output. Address

Box E-874, care of MOTOR AGE

THE MIGHTY **AMAZON** 5000 MILES

The Amazon Rubber Company, Akron, Ohio

LAY Porta Power — Mechanical Farm Hand

Mfd by L. A. YOUNG INDUSTRIES Inc. Detroit — *Write for Dealers' Proposition*

SUNDERMAN

Vacuum Carburetor

SUNDERMAN CORPORATION, 11 Chambers St., Newburgh, N. Y.

ROEDDING SIGNAL TAIL LIGHT

BEST SELLING ACCESSORY on the MARKET

The Roedding Safety rear-end automotive signal is the most wonderful automatic signal device ever perfected. Car and truck owners buy at first demonstration.

Write for our attractive dealer proposition

K. G. BARKOOT, 1010 Chamber of Commerce Bldg., Detroit

The lubrication problem has been solved for all time. Watch the advertising columns of this publication carefully for full details.

USED ON 90% OF ALL FULLY EQUIPPED CARS

KELLOGG ENGINE DRIVEN **Tire-Pump**

KELLOGG MANUFACTURING CO. ROCHESTER, N.Y.

BRISCOE $885

THE CAR WITH THE HALF-MILLION DOLLAR MOTOR

The Real Utility Car

BRISCOE MOTOR CORPORATION **Jackson, Michigan**

APPLY A

NEW TOP COVER

TO YOUR OLD CAR AND MAKE IT LOOK LIKE NEW

Prices $8.00 to $17.00. Parcels Postpaid

You Save 2/3 Price of a new Top, and can apply it yourself. Why sacrifice your old car? Many are better than the new ones. Get our catalogue. It's a money saver.

We specialize in **Top Covers, Auto Tops, Tires, Seat Covers**

Liberty Top & Tire Co., 126 E. 8th St., Cincinnati, O.

CONTRACT WORK DEPARTMENT

You will save time and money by consulting this Department

Inner armor for automobile tires prevent punctures and blow-outs. Double mileage of any tire, old or new. Easily applied without tools. Used over and over in several tires. Will not heat or pinch. Cheaper and better than double treads, etc. Details free. Distributors and agents wanted. Sales guaranteed.

INSYDE TYRES

AMERICAN ACCESSORIES CO., 250 Gulow St., Cincinnati, Ohio

The Motor Truck bought today without Electric Starting and Lighting will be out of date to-morrow

BETHLEHEM *Internal Gear Drive* **MOTOR TRUCKS** *Dependable Delivery*

BETHLEHEM MOTORS CORP'N. ALLENTOWN, PA.

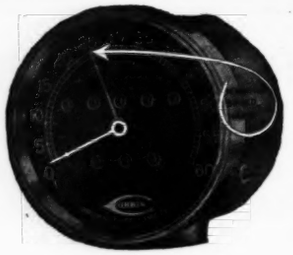
The Motor Truck bought today without Electric Starting and Lighting will be out of date to-morrow

The **BILLINGS & SPENCER CO.**

Hartford, Conn.

Hand Tools Forgings — Forge Shop Machinery

A Mark of Quality



YOU assure yourself of lasting accuracy and give your car an additional touch of distinctive quality when you use the

CORBIN-BROWN SPEEDOMETER

Built of highest grade materials. Correct in design. Simple in mechanism. Amply strong in all parts. Backed by the Corbin reputation for manufacturing reliability.

The Maximum Speed Hand, an extra feature, adds to your comfort and protects you. Registers your highest speed and stays at that point until you return the hand to zero, which can be done in an instant. Eliminates necessity for watching speedometer while driving at high speed, as the speed record stands as long as you want it.

Write For Catalog

CORBIN SCREW CORPORATION
American Hardware Corporation, Successor
NEW BRITAIN, CONN.

BRANCHES: NEW YORK, CHICAGO, PHILADELPHIA

Power for Every Road and Load

Wisconsin
CONSISTENT

Truck Motors

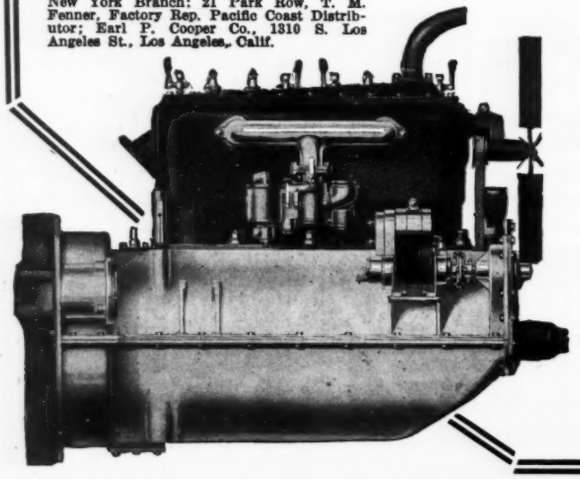
NOTE THESE FEATURES:

Cylinders—Cast en bloc. Crankshaft—Four bearing, chrome nickel steel, 2 in. diameter. Valves—Rich Tungsten steel. Connecting-Rod Bearings—3 in. long, 2 in. diameter. Bearings—Bronze, Fahrig metal lined. Cam-shaft—One piece, cams integral. Oiling System—Force-feed hollow crankshaft, 3 Point Suspension.

Write today for detailed specifications and illustrations

WISCONSIN MOTOR MFG. CO.
Sta. A, Dept. 311 MILWAUKEE, WIS., U. S. A.

New York Branch: 21 Park Row, T. M. Fenner, Factory Rep. Pacific Coast Distributor: Earl P. Cooper Co., 1310 S. Los Angeles St., Los Angeles, Calif.



Index to the

Advertisements

THE ADVERTISERS' INDEX is published as a convenience and not as a part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

Victor Truck Attachments

FITS All Passenger Cars, Making a Strong Durable 1 or 2 Ton Truck, Using Clark Internal Gear Axles, Tuthill Springs, Acme Universal Joints and Propeller Shafts, Artillery Type Wheels, Solid or Pneumatic Tires "as specified," 5" Channell Steel Frame. "SAVE MONEY." The Upkeep is included in the first cost.

1-Ton, $425.00 **2-Ton, $525.00**

MR. DEALER:—Let us mail you our Attractive Proposition.

SIMPSON TRUCK COMPANY
ST. JOSEPH, MICHIGAN

For immediate and permanent repair of tubes and casings; for holding long rips and blowouts with the strength of a **solid section**—the Self-Vulcanizing Fabric Patch—another

WONDER WORKER SPECIALTY

A patch so thin, so strong, and sets so everlastingly that it will never ruffle up, creep or slide off. First a layer of *uncured gum*, reinforced by a layer of *cured rubber*, backed by genuine Government Khaki fabric. QUALITY.

The Self-Vulcanizing Fabric Patch comes in tin lithographed tubes, to go safely and handily into your tool bag. WONDER-WORKER means quality from chemicals to containers. For prices and descriptions of complete line, see catalogue; address—

THE HALL-THOMPSON CO.
HARTFORD CONNECTICUT

If The World Ends January First—What Then?

Well, let us live while we live. If after January First, the manufacture of motor cars should have to be discontinued because the government wants the steel, there's no use crying about it. We must just accept the decree.

But the war will end sometime, and when that time comes, there'll be a scramble to get back into our regular lines of business.

The wise dealer will mend his fences and plan against that time.

He will take advantage of his rival's lassitude to secure a line that will guarantee him a permanent and profitable business.

But meantime, he will take advantage of present conditions and get every last car he can from the factory output between now and January 1st, so that if the worst comes to the worst, he will have cars to supply his trade for several months yet, when there will be a tremendous demand and—no competition.

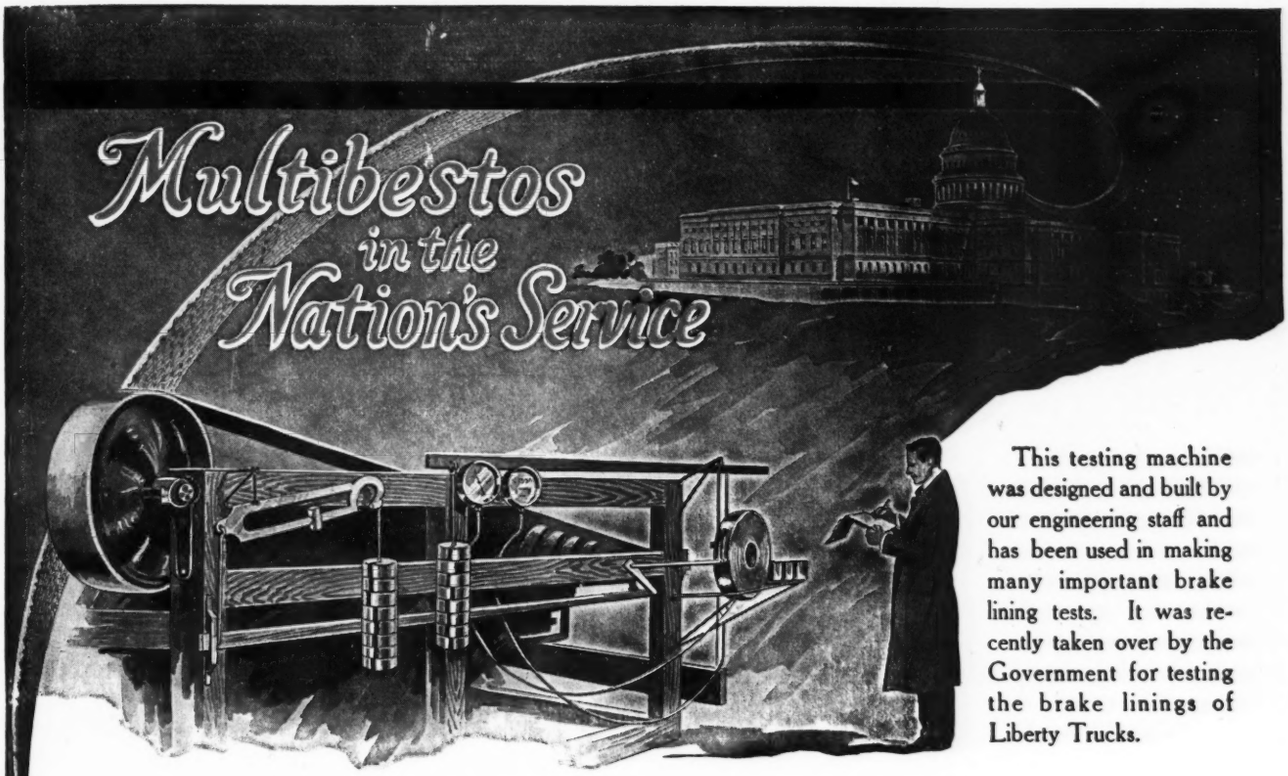
These times test the metal of men—manufacturers and dealers.

Men who maintain their balance will make money and lay a solid foundation for the future.

Don't overlook the fact that every car you sell now makes another permanent customer for your garage—for accessories and supplies. And that alone can be a pretty profitable business if you have enough of it.

Chalmers Motor Company

Detroit, Michigan



This testing machine was designed and built by our engineering staff and has been used in making many important brake lining tests. It was recently taken over by the Government for testing the brake linings of Liberty Trucks.

TESTS in laboratory and road service clearly prove the superiority of Multibestos. Its firm weave of asbestos and brass wire withstands more heat than is ever generated in the brake drums—even under the hardest service.

This gives Multibestos greater wear resistance, together with its famous frictional or gripping quality.

It is as a result of the most exacting tests that Multibestos has been selected as standard equipment on such cars as the Packard, Pierce Arrow and Kelly Springfield.

Multibestos comes to you bearing the endorsement of leading engineers—its quality proved in every kind of truck and pleasure car use.

STANDARD WOVEN FABRIC CO.
Walpole, Mass.

MULTIBESTOS

BRAKE LINING

A STANWAL PRODUCT

CHANDLER SIX

FAMOUS FOR ITS MARVELOUS MOTOR

The Car That Serves!

MEN and women in these days are demanding more than ever before of the automobile they buy — and rightly. For your car must *serve,* must be always ready to go surely and safely.

Time is the avenue to service now. We who are here at home carrying on the fight at the source of production need every hour.

Those who can afford the highest efficiency in their work have no time for street cars, no time to wait for slow, overburdened trains. For this is a time of action. We must *do more* than ever before.

The Chandler Six, famous for its marvelous motor, now in its sixth year without radical changes of any nature, but with constant refinement until today it is an approximately perfect mechanism, is a *dependable* motor car. Full of life and power, sturdily built, enduring, economical in operation and maintenance.

Nearly fifty thousand Chandler owners know how good a car the Chandler is.

Chandler Dealers are Prosperous

SIX SPLENDID BODY TYPES

Seven-Passenger Touring Car, $1795 *Four-Passenger Roadster, $1795*

Four-Passenger Dispatch Car, $1875

Convertible Sedan, $2495 *Convertible Coupe, $2395* *Limousine, $3095*

All prices f. o. b. Cleveland

CHANDLER MOTOR CAR COMPANY, CLEVELAND, OHIO

Export Department: 1790 Broadway, New York Cable Address: "Chanmotor"